CANADIAN MACHINERY AND MANUFACTURING NEWS

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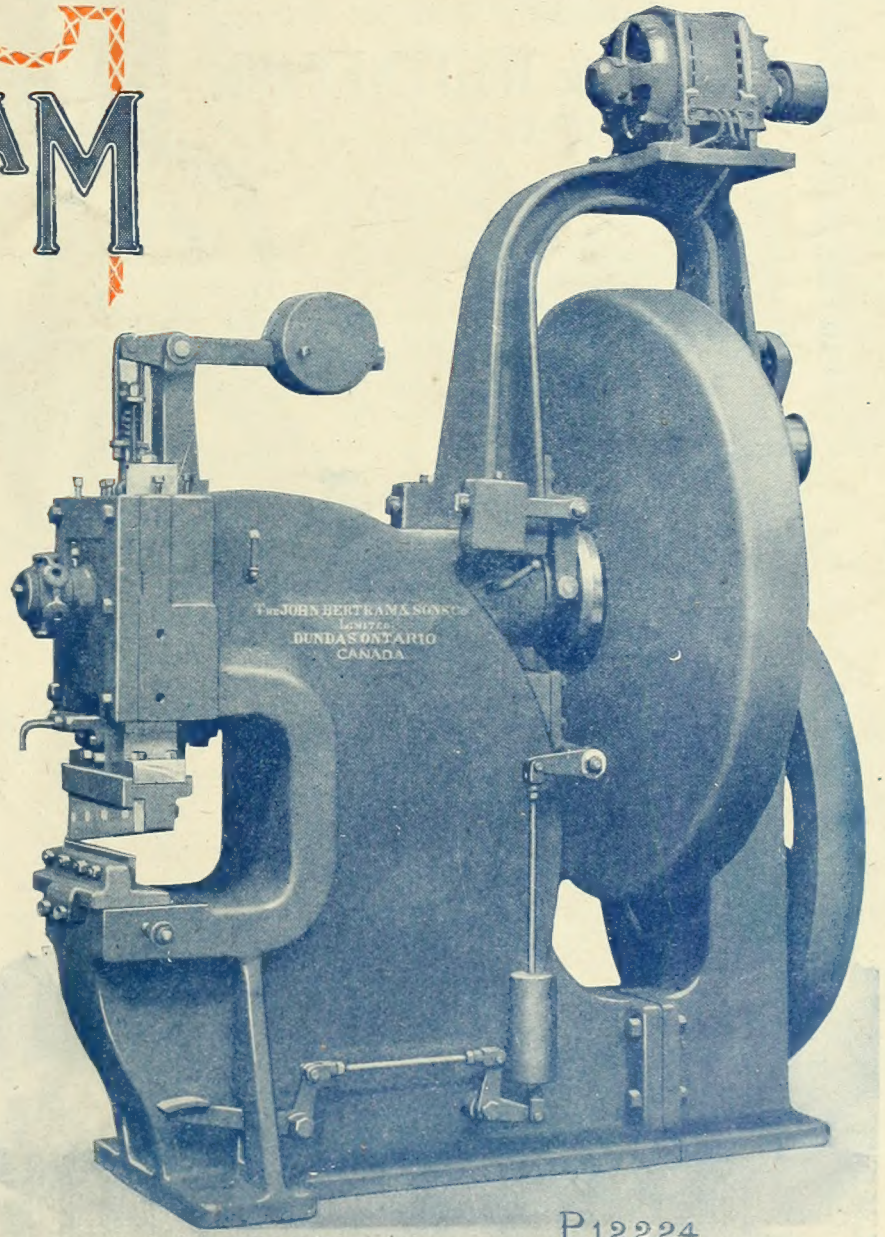
BERTRAM
MACHINE TOOLS

Illustration shows our No. 4 Single Punch and Shear, 12″ Throat Motor Drive through belt, fitted with plate shearing attachments.

Capacity

To punch 1″ hole through 1″ Plate
To shear 1″ Plates
To " 6″ x 1″ Flat Bars
To " 1¾″ Round Bars
To " 4x4x⅜″ Angles



P12224

Write for full particulars re any machine or machines in which you are interested.

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Pratt & Whitney Small Tools enjoy an enviable reputation for excellence that has been well earned in the high production shops of the country. Where stamina as well as exceptional accuracy and precision are required P & W Tools have more than held their own. Our line is complete. It includes taps, dies, milling cutters, reamers, punches, drills, etc., both of standard and special design and in sizes to suit every requirement.

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SMALL TOOLS

PRATT & WHITNEY

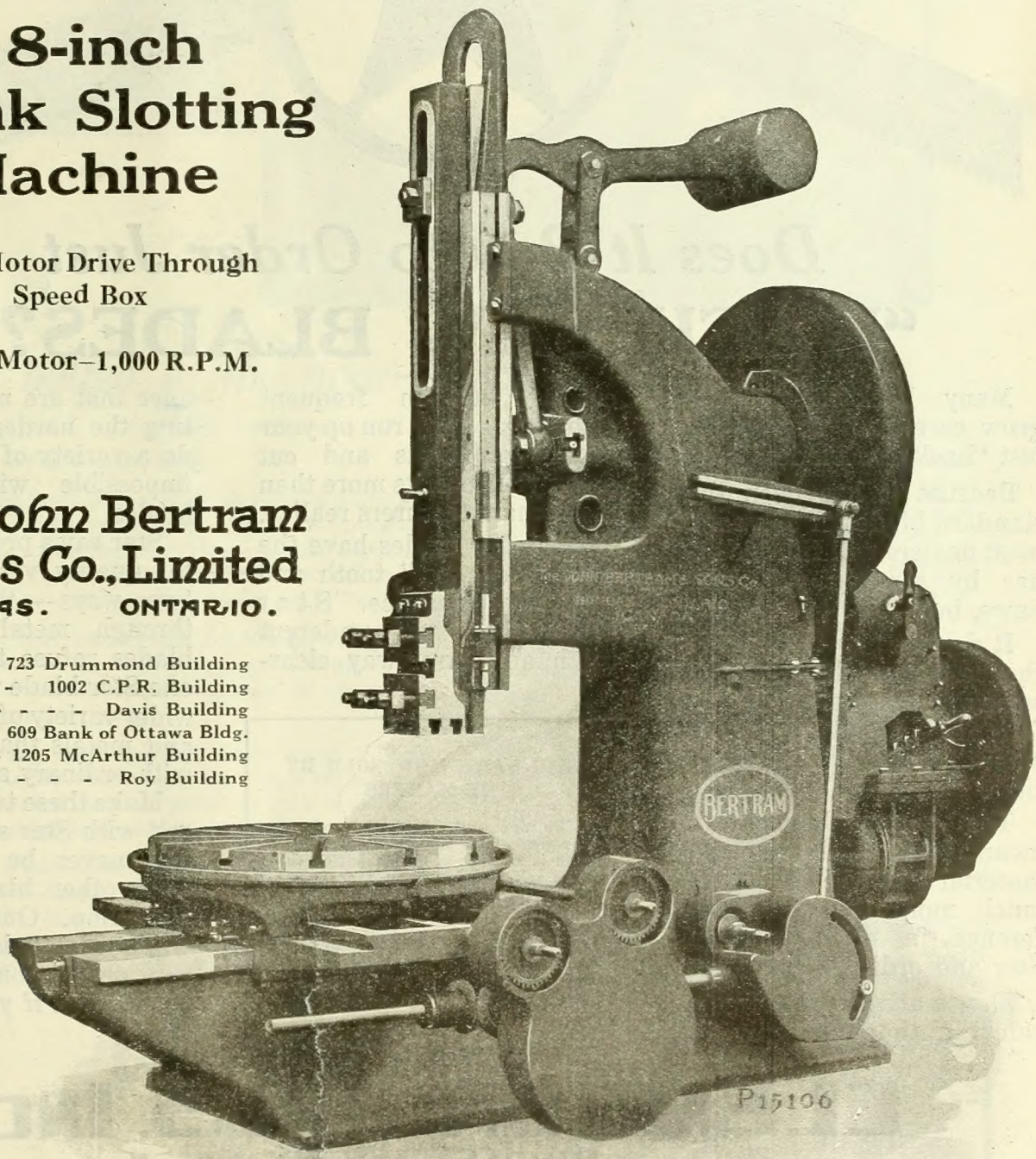
The BERTRAM Page

MACHINE TOOLS

18-inch Crank Slotting Machine

A. C. Motor Drive Through Speed Box

10 H.P. Motor—1,000 R.P.M.



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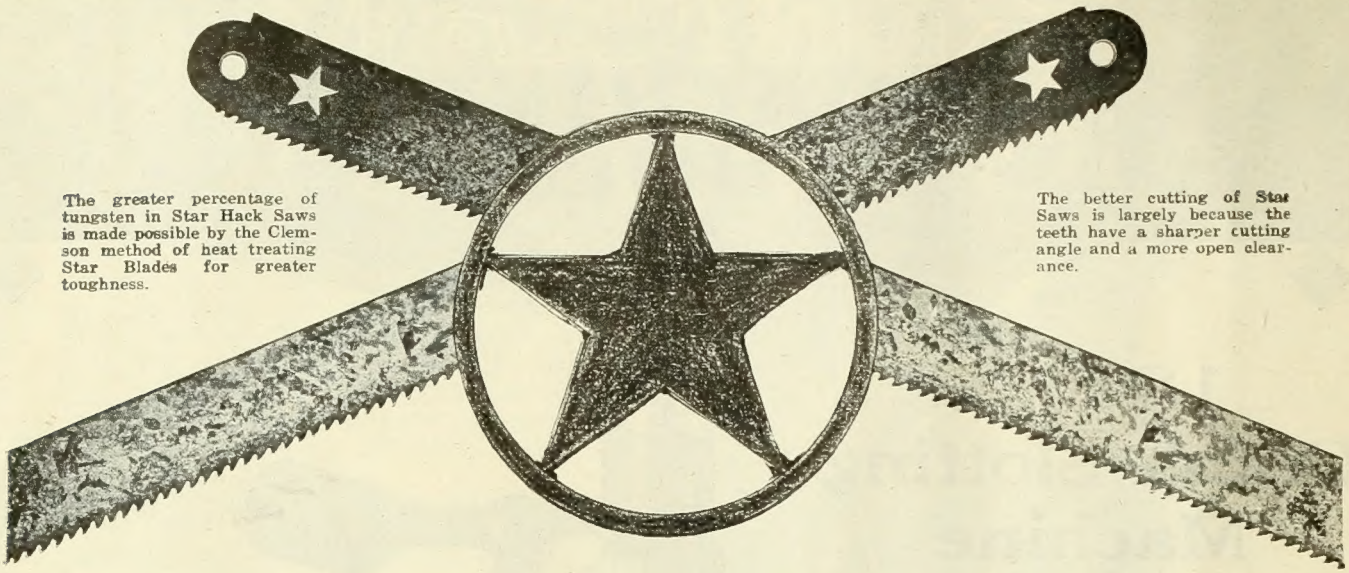

The greater percentage of tungsten in Star Hack Saws is made possible by the Clemson method of heat treating Star Blades for greater toughness.

The better cutting of Star Saws is largely because the teeth have a sharper cutting angle and a more open clearance.

Does It Pay to Order Just "HACK SAW BLADES?"

Many hack saw users grow careless. They order just "hack saw blades."

Because it has been the standard blade for 35 years, most dealers will fill this order by sending you Star Saws, but —

It doesn't pay to take the chance. You might get fooled some day by receiving an inferior saw blade. It's much safer to specify "Star," every time.

The poorer blade will mean a loss, both in time and material that will amount to much more than the difference in price between Star and ordinary blades.

Slow cutting blades waste valuable time not only in cutting but in frequent changing. They run up your production costs and cut down your profits more than many manufacturers realize.

Ordinary blades have the old "wood saw" tooth and two-way clearance. Star blades have an undercut tooth and three-way clearance that are made for cutting the hardest metal and do a variety of work that is impossible with ordinary blades.

Star saws prove their better quality very quickly in two ways — they will go through metal that other blades refuse to cut. And one Star blade will cut a far wider variety of sizes, shapes and metals than is possible with ordinary saws.

Make these two tests yourself with Star saws and you will never be satisfied to have other blades used in your shop. Our service men will be glad to help you solve your production problems on Hack Saws if you will write us.

STAR SAWS NOW SOLD BY THE MAKERS

We now sell our own product for we believe no other organization is in such a good position to give selling service on Star Saws as our own factory that has made them for 37 years.

We are not satisfied only to sell you Star Blades but stand ready to render you every service in getting the best results in their use.

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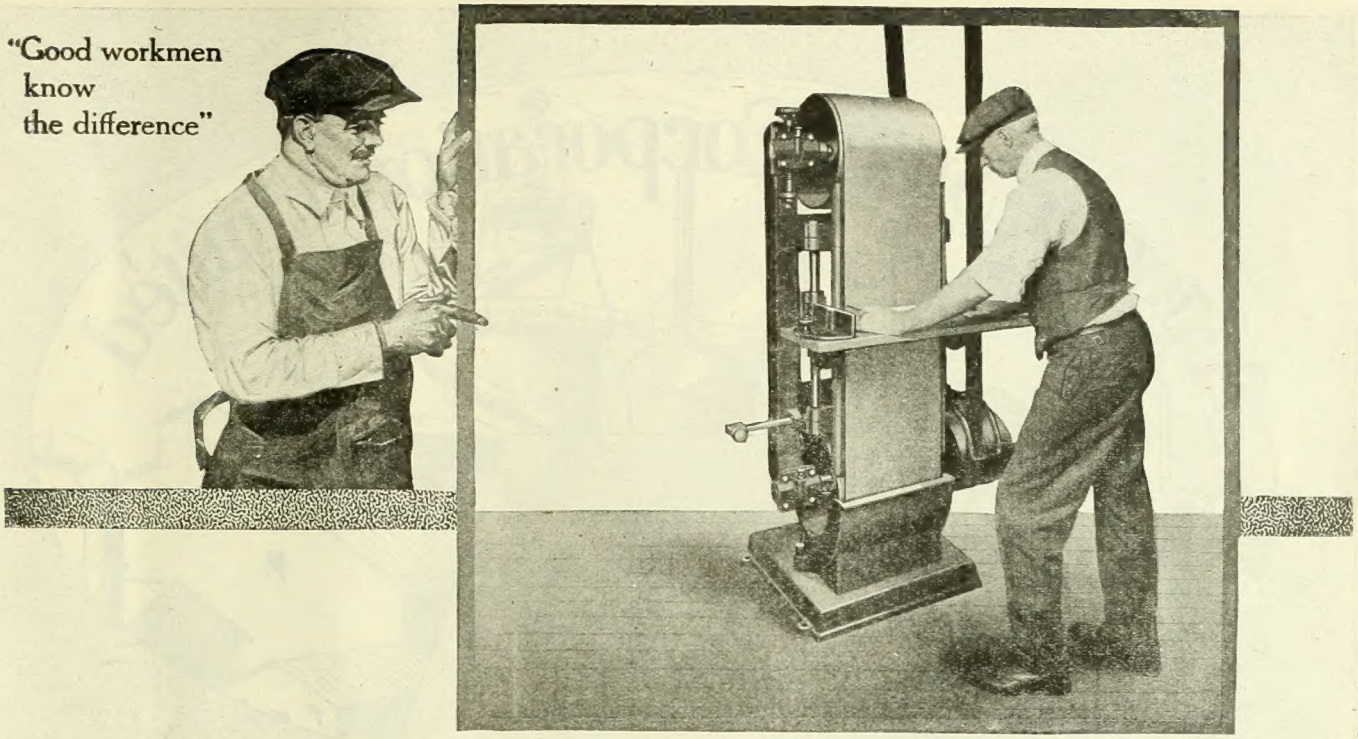

Not bolted to the floor—why?

(Ask Gordon Scott, He Knows)

This was in August, 1919.

Gordon Scott, Manager of the Peerless Surfacing Machine Company of Troy, New York (manufacturers of Peerless Surfacing Machines), laid down the report of the tests. "It's as if we had built a fine safety razor but couldn't get good blades for it," he said.

These tests showed that Peerless Surfacing Machines were O. K., true-running, production boosters—that the defective work complained of was due to the abrasive belts used.

"Ordinary belts won't do," ran the report. "Their belt joints are thicker than the rest of the belt and give a marked 'hop' or 'jump' on each revolution. This causes marred, scratched work."

And a little further down Scott read, "One belt stands out—Speed-grits Uniflow belt. Recently developed by Manning Abrasive Company. Has an absolutely flat joint. No 'jump' or 'hop' no matter how many R. P. M. Gives perfect finish."

Now notice the picture above. A Peerless Surfacing Machine running at top speed while simply set on the floor (*not* bolted). Its "jumpless" Speed-grits Uniflow belt is grinding a block of carbon steel.

On steel, alloy, iron, wood, or hard rubber—smooth-running Speed-grits Uniflow belts give speed in production *plus* perfect finish.

Today you can order Speed-grits Uniflow belts by mail—one or a dozen. Just send a piece of a wornout belt of the type now being used.

(Many abrasive-belt users tell us that taking the "jump" out of the belt joint is the biggest thing accomplished in the abrasive industry since the discovery of artificial abrasives.)

Why not find out? Order your trial Uniflow belts today.

"Good Workmen Know the Difference."

Send for "The Difference Book"—Address

RITCHEY SUPPLY COMPANY

154 Pearl Street (CANADIAN DISTRIBUTORS) **Toronto, Canada**

Or Send to Manning Abrasive Co., Troy, N. Y., U. S. A.

Manning Speed-grits

Look for this trade-mark on the back of every belt, sheet or disc.

Manning Speed-grits

Reg. U.S. Pat. Off.

Don't say sandpaper—say Speed-grits

Speed-grits
comes in the following varieties:

METALITE CLOTH
HANDY ROLLS
GRINDING DISCS
DURITE CLOTH
DURITE PAPER
DURITE COMBINATION
DURUNDUM PAPER
DURUNDUM CLOTH
GARNET PAPER
GARNET CLOTH
GARNET COMBINATION
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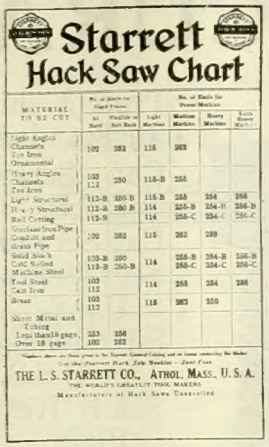

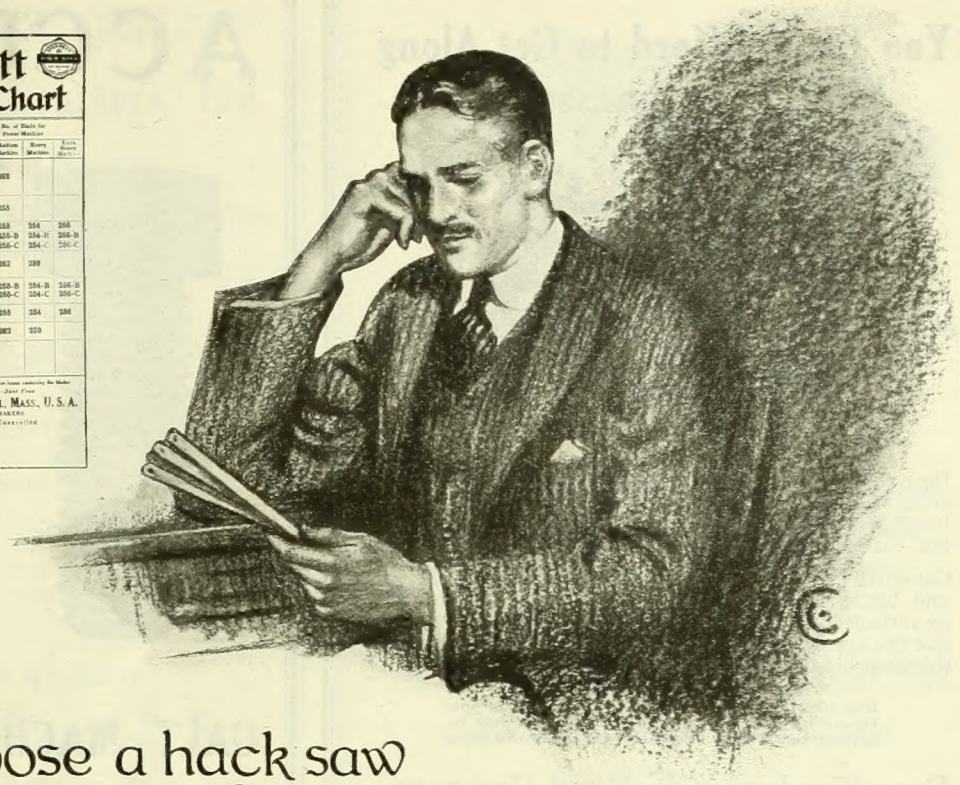

Do you choose a hack saw for appearance - or performance?

Hacksaws all look about alike. Weight, teeth, thickness and finish seem to be similar. The difference is in their performance.

No matter how good the saw may be it's certain that the blade made to cut soft metal won't cut cold rolled stock. There's no such thing as a hacksaw capable of cutting all materials equally well. Fact is, there's only one way to be sure of the right blade and that's by the hacksaw chart.

Picking the right blade for the particular kind or shape of metal is easy if you use Starrett saws according to the Starrett Hacksaw Chart.

We will be pleased to mail you a copy of the chart. Free. Also ask for Catalog No. 22 "3".

THE L. S. STARRETT COMPANY
The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled
ATHOL, MASS.

STARRETT HACK SAWS CUT QUICKER LAST LONGER

STARRETT THE TOOLS

42-131

Use Starrett Hack Saws

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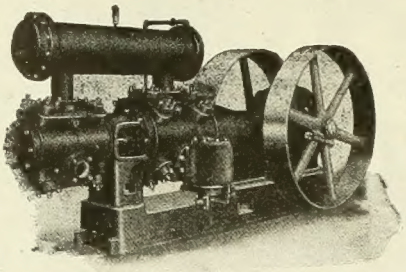
You Can't Afford to Get Along Without Compressed Air



Its uses throughout the plant from foundry to paint shop and shipping floor are so numerous and so extensive that the question is not whether to use air, but rather, where else can we use compressed air?

Canadian Ingersoll-Rand Compressors, Air Hoists and Little David Pneumatic Tools play a large and important part in such calculations, for to them is due the credit of making the pneumatic way of doing things a bit less expensive.

Our nearest sales office will gladly advise you regarding new equipment or show you how to get more and better service from what you have

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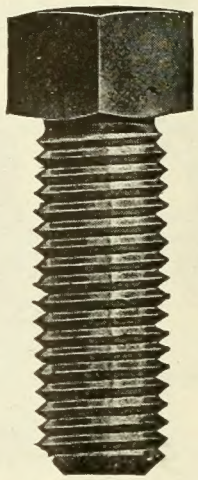

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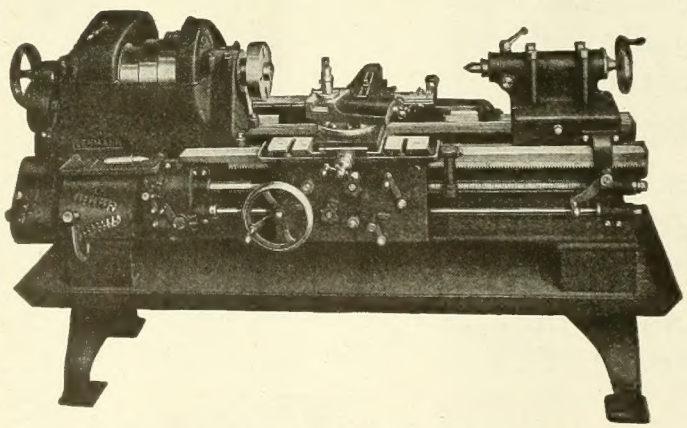

TWO SIZES—16", Swing 18¼" and 18", Swing 20¼"

Because they are constructed "right" of the best material, workmanship and design, and therefore are adaptable to all conditions, whether it be work requiring accuracy to the highest standards or for the heavy duty where power, strength and rigidity are required.

Convince yourself of these facts! Let us send you complete specifications of this superior lathe and the names of some of the larger concerns who are using "LEHMANN LATHES" for better results.

We know you are interested, so don't put off writing us. Do it to-day. Now!

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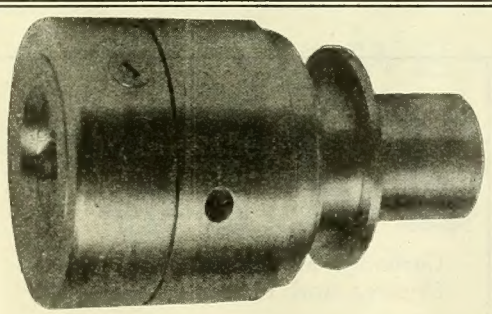

No. 2 TYPE "R" Hartness Automatic Die

WITH SHANK FOR REVOLVING SPINDLES

These dies are designed for use on either vertical or horizontal spindles. Die is re-locked by forward motion of sleeve, which may be actuated by a yoke working in the groove or by a fixed stop making contact with rear edge of sleeve at the return stroke. Die is unlocked in the usual manner by retarding its forward motion or by a fixed stop, making contact with the external tripping button shown on the face of the die. External tripping button is especially desirable in cutting very short threads as it relieves the thread of the strain incidental to unlocking by the pull-off device.

The diameter of the No. 2, Type R die is 3 3-16 in., and its length as shown is 3½ in.

The Die cuts both right and left-hand threads ½ in. to 1 in. in diameter, and from 10 to 40 threads per inch.

Shanks are varied to meet individual requirements.

A set of standard chasers in carbon steel is supplied gratis with each Die.

No tools of any kind need be used in changing chasers.

A chaser grinding jig is supplied gratis on Die orders if desired.

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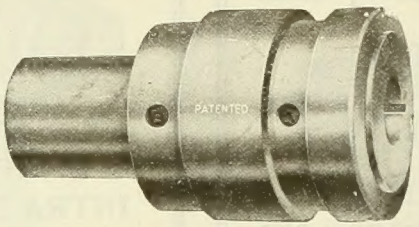
IF YOU BUILD MACHINERY

you are anxious to put into your product every refinement which will add to its efficiency—which will make it serve your customer longer and more satisfactorily.

One of the most important features of any machine is its clutches. No single item adds more to machine performance than a good clutch, and nothing can be a greater source of annoyance than a poor one.

Play safe and equip with Johnson Clutches.



Write for Our Yellow Catalog and Booklet "Clutches as Applied to Machine Building"

IF YOU USE MACHINERY

you are looking for the machine with the highest rate of production, the smallest amount of lost time, and the longest life. In all probability you will find that machine equipped with a Johnson Clutch, for the Johnson Clutch not only gives best service, but adds greatly to the convenience and speed of operation.

Look for it on the machine you buy, and to be consistent equip your plant transmission in the same way.

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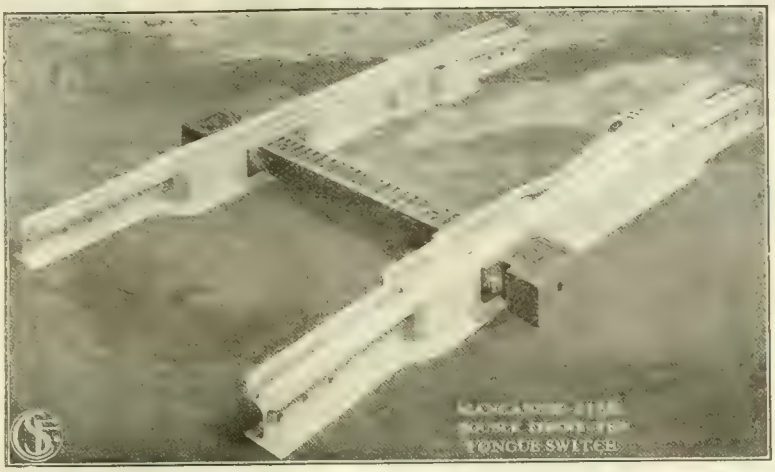

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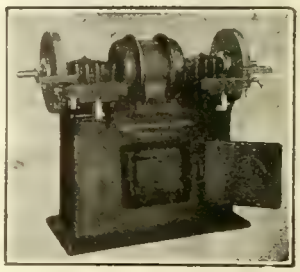
Water Tool Grinder

SO many and varied are the jobs handled by Ford-Smith Grinders and Polishers that it becomes almost a modern necessity to have them in your shop. Ford-Smith Grinders and Polishers are sturdily constructed, dependable tools built for all kinds of heavy work. They go a long way toward lowering costs by conserving power and saving time.

Ford-Smith tools include Motor Driven Grinders, Floor Grinders, Bench Grinders, Water Tool Grinders, Swing Grinders, Disc Grinders, Buffers and Polishers and Swivel Tables.



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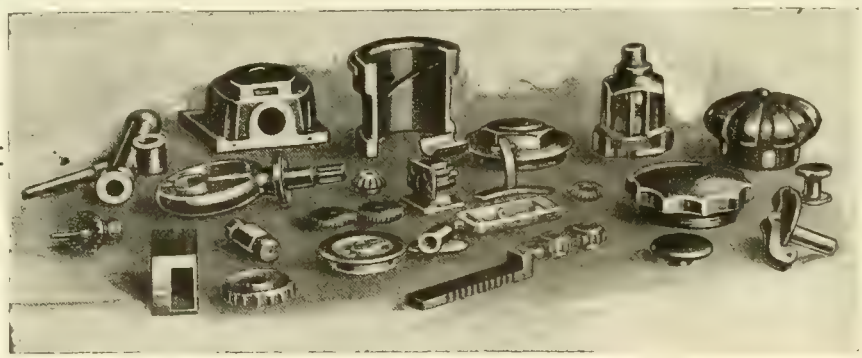

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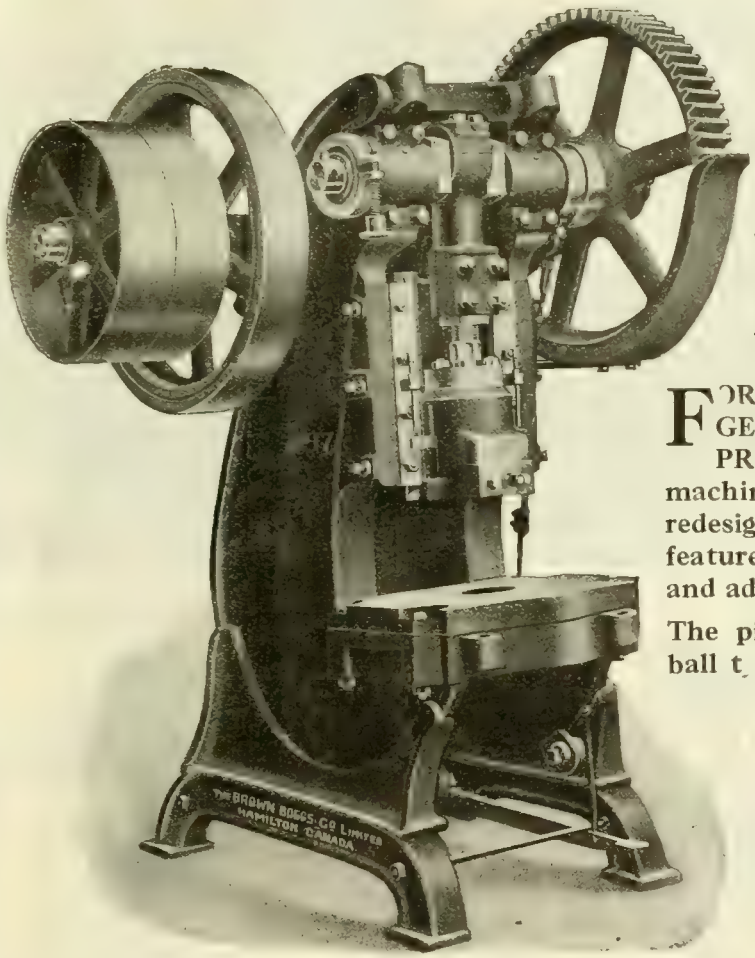

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FOR general efficiency this No. 17 GEARED INCLINABLE POWER PRESS is far in advance of any machine tool of its kind. It is our redesigned type and embodies several features that increase its output and add life to the dies.

The pitman connection is of the ball type, made from High Carbon Steel, carefully heat treated so as to give the maximum Service.

Crankshafts are also made from Carbon Steel properly heat treated, which greatly increases their tensile strength and prevents crystallization.

We manufacture a full line of Power Presses for blanking, forming, punching, trimming, etc., in many different types. Let us send you full particulars.

THE BROWN-BOGGS CO. LIMITED
HAMILTON, CANADA.

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Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

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Has an Advantage Over Other Grinders

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The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.

American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

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Tool Steel
"ARGO" BRAND *HIGH-SPEED* STEEL

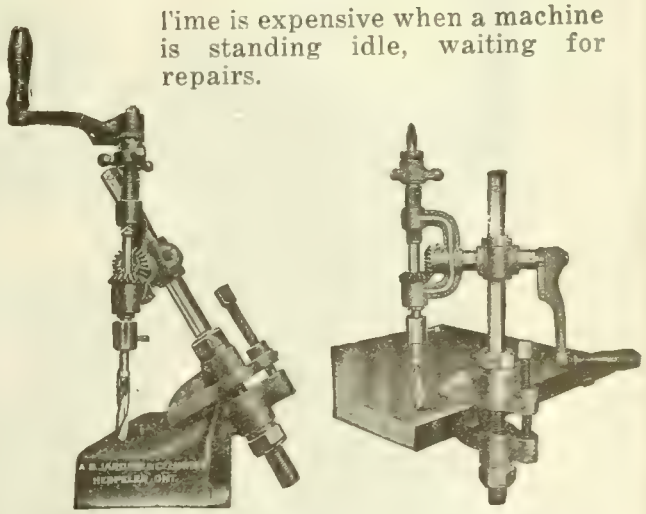
The John Illingworth Steel Co.
1856

Frankford, Phila.
New York Office 217 Broadway

RALPH B. NORTON, AGENT
124 Craig St. W.
Montreal, Canada

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses.

A. B. JARDINE & CO., Limited
HESPELER, ONTARIO

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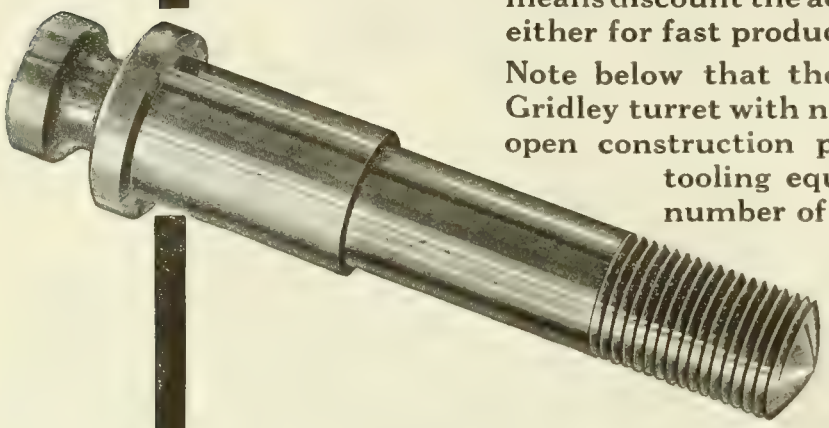
For Fit and Finish— the GRIDLEY



Requirements for fine fit or exceptional finish by no means discount the advantages of Gridley Automatics, either for fast production or low costs.

Note below that the tools are held securely on the Gridley turret with no overhang. More than that the open construction permits the use of all kinds of tooling equipment to secure a maximum number of operations as well as facility in setting up the job.

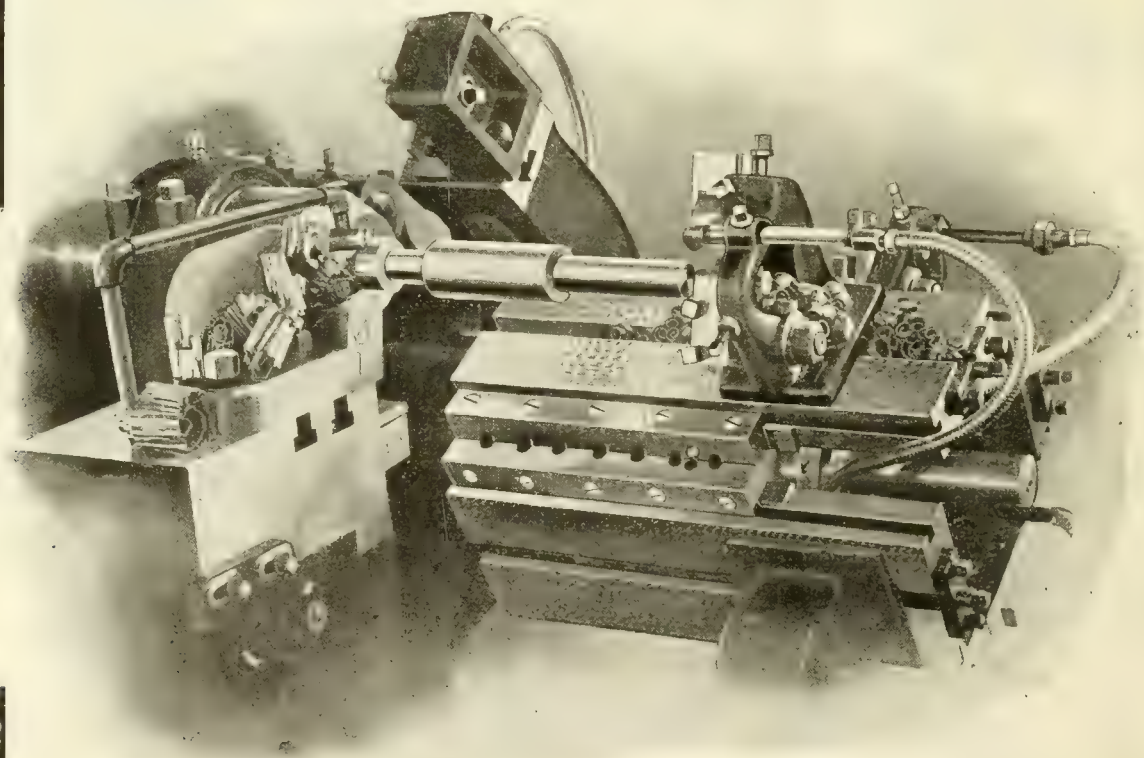
These are backed up by the known high standards of Gridley Turret Lathe construction.

Get Gridley output figures—accuracy guaranteed.

THE NATIONAL ACME COMPANY
WINDSOR, VERMONT

GENERAL OFFICES, CLEVELAND, O. CANADIAN SCREW PLANT, MONTREAL, P. Q.
BRANCH OFFICES: NEW YORK BOSTON CHICAGO DETROIT BUFFALO
WAREHOUSES: NEW YORK AND CHICAGO REPRESENTATIVES IN PRINCIPAL FOREIGN COUNTRIES

Makers of Gridley Single and Multiple-Spindle Automatics at Windsor, Vermont; and Acme Automatics, Threading Dies, Collapsing Taps, and Screw Machine Products at Cleveland, Ohio



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Buyers should instruct their representatives in the United Kingdom to communicate with The Secretary, Disposal Board, Ministry of Munitions, Caxton House, Tothill Street, London, S.W. 1.

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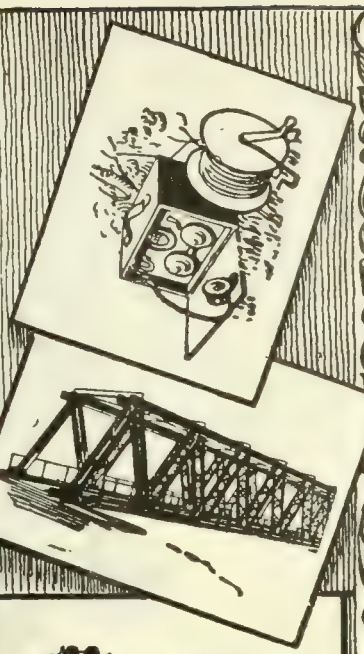
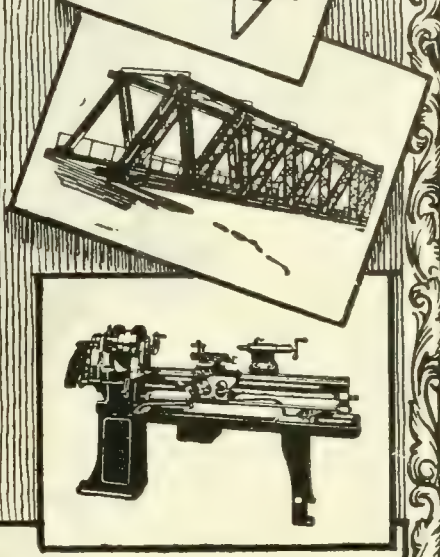
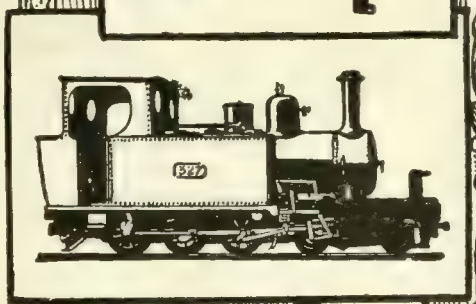
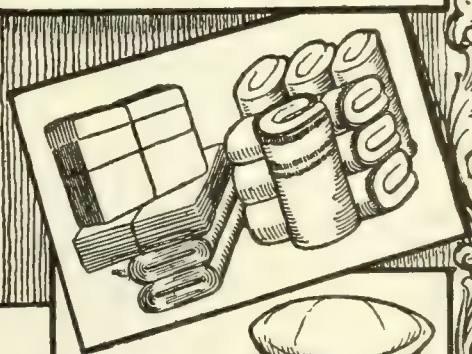

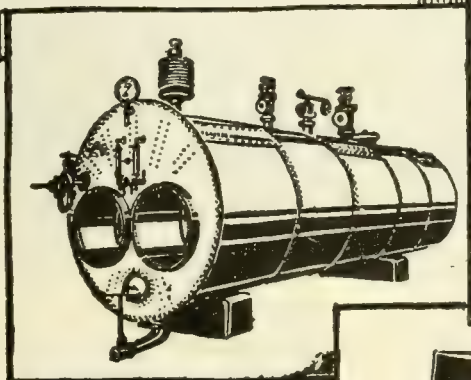
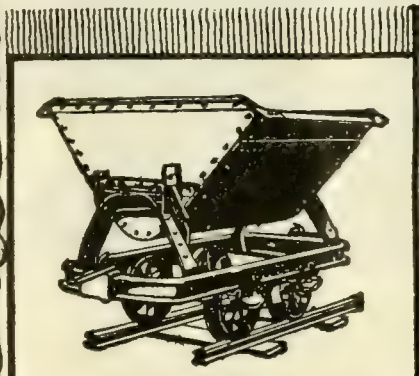

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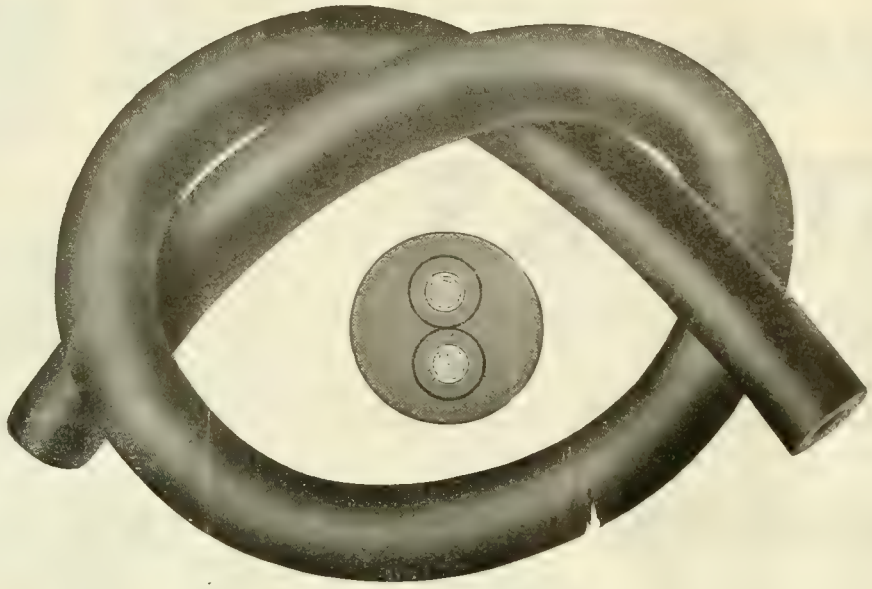

Cab Tire Cable

A flexible, wear-resisting cable especially designed for industrial use. The several conductors are individually insulated with rubber and further protected by a heavy outer jacket of smooth, tough, and flexible rubber.

Like its namesake, the Cab Tire, it is manufactured to stand rough usage and to give service under the most trying conditions.

Railways, Shipbuilding Companies, and Industrial Works are amongst the largest users. It fills a long-felt want for a suitable flexible for portable lights on ships. Railways find it the ideal cable for motor-driven tools in shops and round-houses, while in Chemical Works the absence of braid covering has made it particularly desirable.

Northern Electric Company
LIMITED

Montreal	**Toronto**	**Regina**
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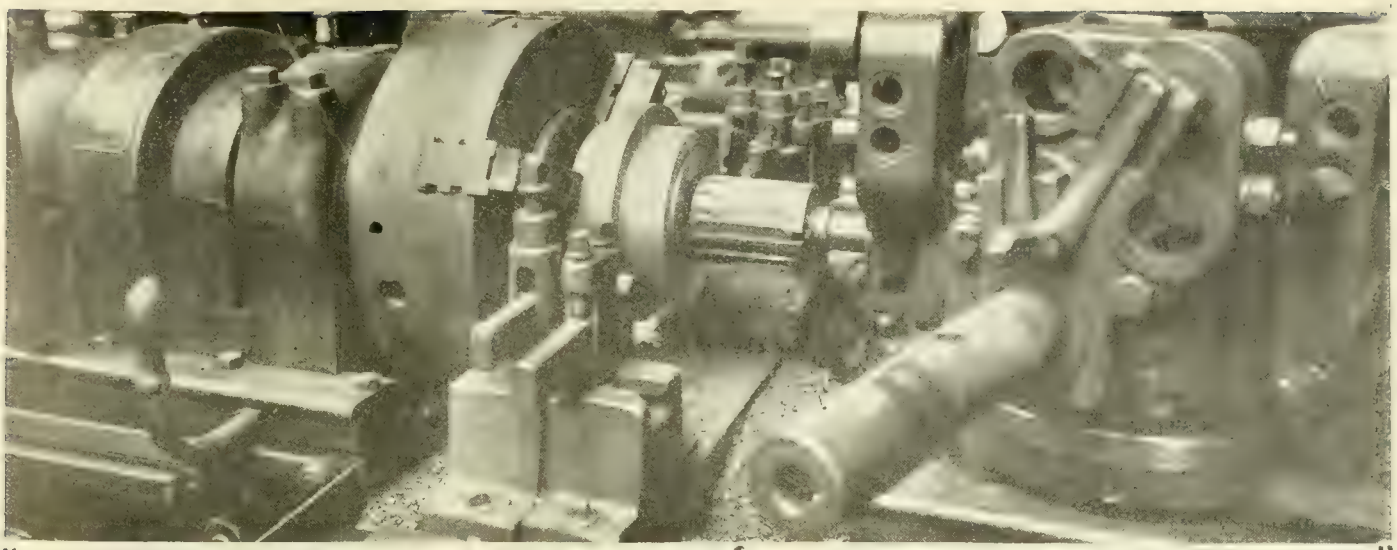
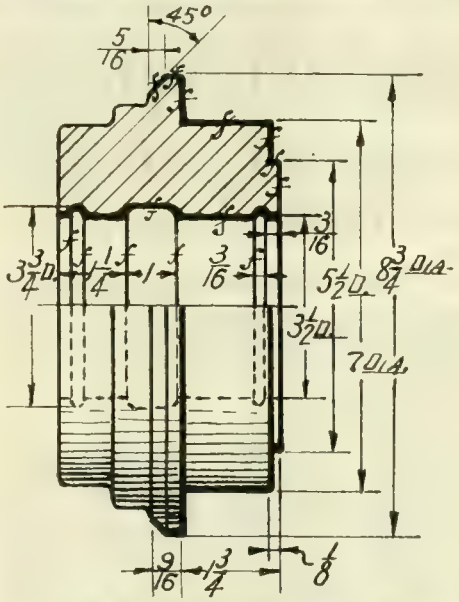




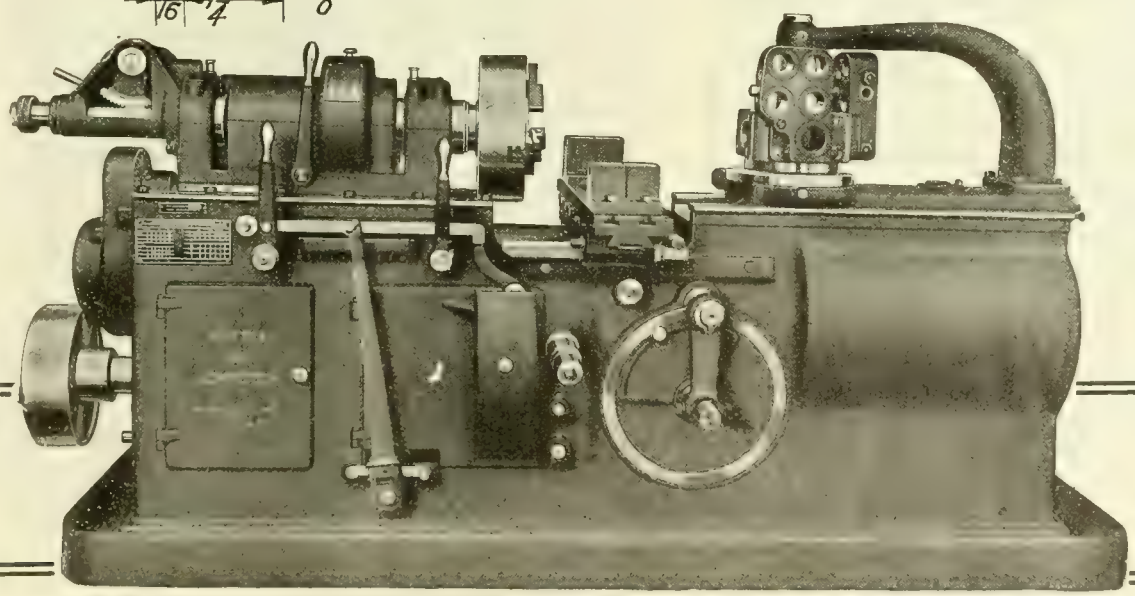
Are you Getting

your equipment requirements for your New Year productions?

Let us give you some figures that will help you to decide.

Compare the illustration with some of your parts, and then send your prints or samples along.

Ask for Bulletin No. 41.



Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office and Showrooms

11 Wellington Street East—Toronto, Canada

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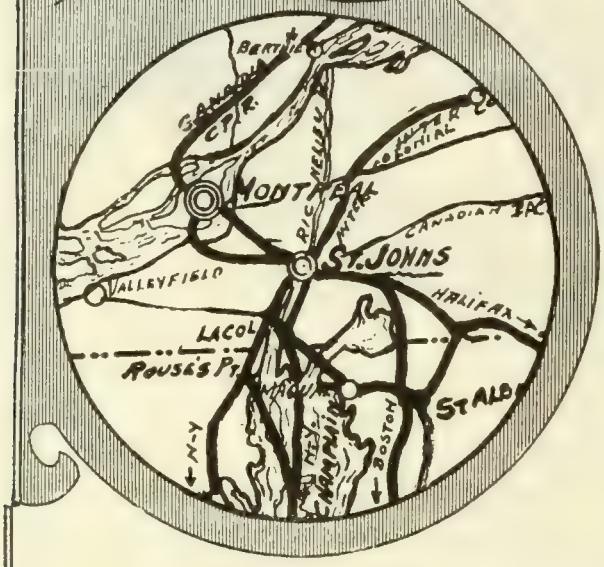
The City of ST. JOHNS, QUEBEC



Offers To Manufacturers—

A Cash Bonus On Your Payroll, Exemption From Taxes, Etc.

Already a busy industrial centre, St. Johns is rapidly expanding and now offers unparalleled inducements to encourage the establishment of new industries.

Every new industry is exempt from taxation for a period of fifteen years, such period being subject to extension. A bonus of 5 per cent. will be paid on your payroll for a period of five years. If you desire it, the city will advance this to you to be applied to the purchase or erection of any building suitable to your purpose. All public improvements you may require, such as street extensions, sidewalks, waterworks and sewage will be attended to by the city.

In addition to these inducements, St. Johns enjoys one of the finest industrial locations in Canada; has unequalled transportation facilities, an adequate fuel, power and labour supply, making it an unusual industrial opportunity.

No Other City Can Offer These Combined Advantages

Seven railroads, including Canada's great transcontinental lines.

Finest ocean shipping facilities.

Canal connections with New York, the Eastern States and the Great Lakes.

Cheapest labour market in Canada.

Plentiful supply of skilled and unskilled labour.

Cheap and abundant electric power.

Cheap coal and lower freight rates.

Desirable factory sites with all public conveniences immediately available.

Extraordinary inducements to new industries.

For more specific information write to

The Secretary of the City Council

ST. JOHNS, QUEBEC, CANADA

Steel Fingers Slip into The Flutes

Grip the broken tap and back it out before you've had time to count three times sixty.

The Walton Tap Extractor

removes broken taps buried below the surface of the work without trouble or loss of time. It removes any broken tap without injuring the thread. It saves the casting or forging. Pays for itself over and over—often on the very first job.

How many do you want on trial?

The Walton Co.

Hartford - - - Conn.

"Alloyed under the Stanley Process"

for general service

Lionroyal

Made in Canada

This BABBITT Metal has a greater range of service than is possible in any other Bearing Metal at a corresponding cost—it has a strength which will easily withstand impact and pressure, yet will run cool at high speed with little lubrication—

There are thousands of places in which high-priced Genuines are used where "LIONROYAL" will serve as well.

Try a Sample Case and Judge for Yourself.

BRITISH SMELTING & REFINING COMPANY LIMITED

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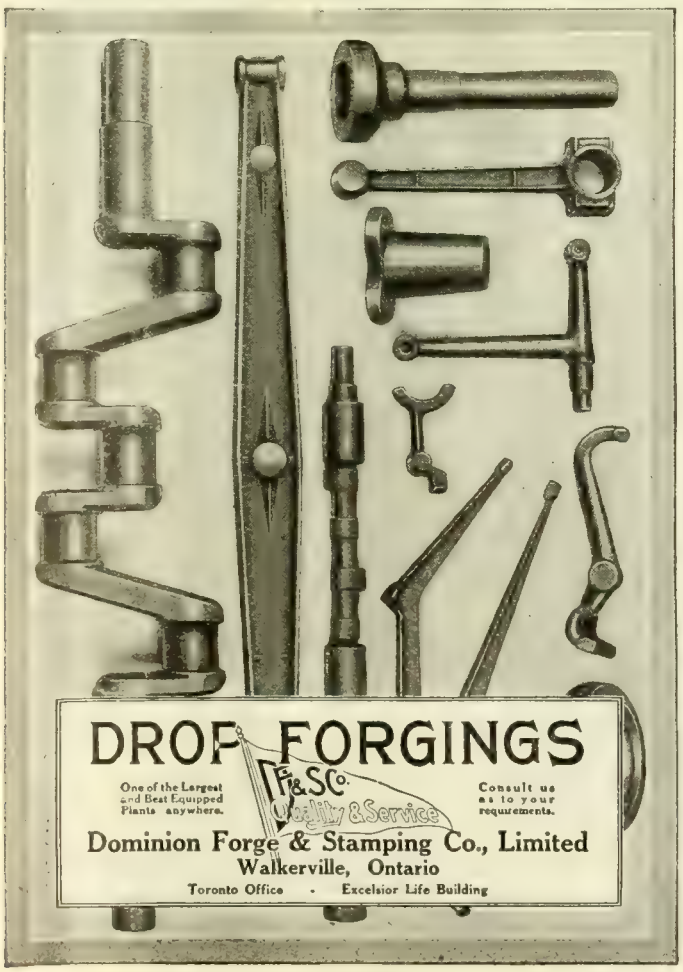
DROP FORGINGS
One of the Largest and Best Equipped Plants anywhere.
F. & S. Co.
Quality & Service
Consult us as to your requirements.
Dominion Forge & Stamping Co., Limited
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Toronto Office - Excelsior Life Building

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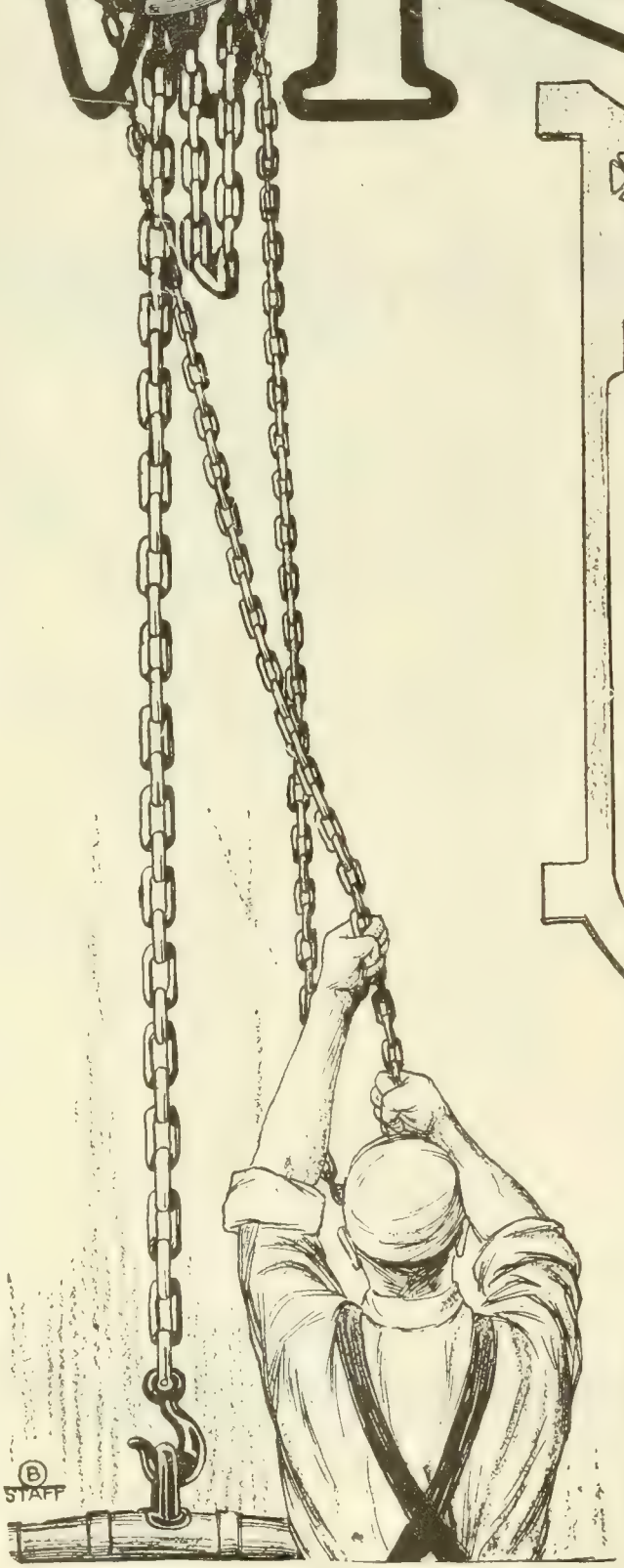
WRIGHT

HOIST



When you buy a hoist you want a *Wright* because it is a specialist in strength, dependability and safety.

Made by the company that specializes in hoists.

WRIGHT MANUFACTURING COMPANY

LISBON, OHIO, U.S.A.

Canadian Distribution

The A. R. Williams Machinery Co.

St. John Halifax, Toronto, Winnipeg, Vancouver, Montreal

A Problem In Every Spring

BECAUSE a spring is more than a twisted wire, it is only rarely that the experience of the manufacturer enables him to properly design the springs which go into his product. If you can we will follow your specifications to the letter.

Otherwise, better depend upon us for this service as hundreds of manufacturers do. For our 63 years of spring-making experience, added to our sound engineering practice, enables us to fill your requirements in a practical way. Only the other day our Engineering Department re-designed a client's spring so that it can be produced for half the cost. And we supply exactly the springs you need — daily, weekly or monthly.

Let us put this ability at your service on your product new or old.

THE WALLACE BARNES COMPANY

"Spring Makers for Three Generations"

Main Office and Works: Bristol, Conn.
Western Sales Office: Book Bldg., Detroit

Springs of steel, brass, phosphor bronze or vanadium flat, coiled, spiral—compression, extension or torsion. Wire Forming, Spring Washers, Small Parts of steel, brass, etc., in any finish. Assemblies. High Carbon Cold-Rolled Steel.

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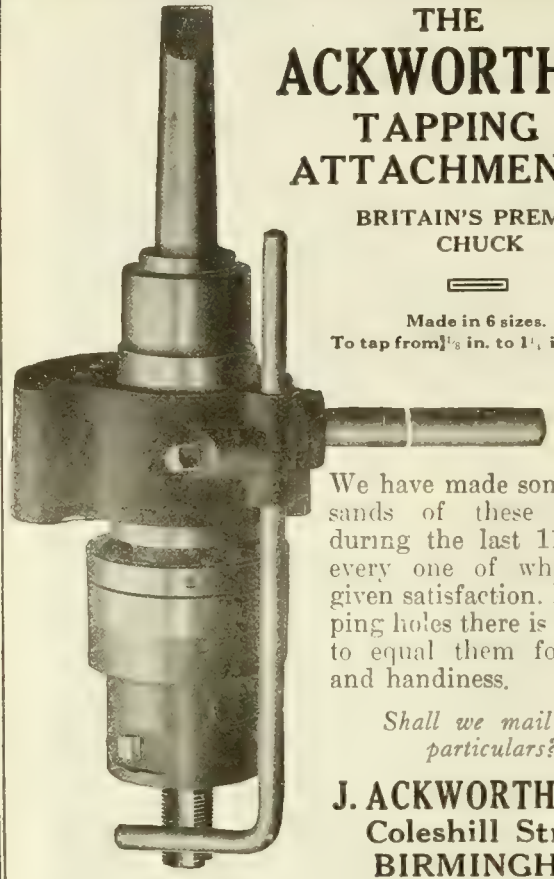


THE
ACKWORTHIE
TAPPING
ATTACHMENT.

BRITAIN'S PREMIER
CHUCK

Made in 6 sizes.
To tap from $\frac{1}{8}$ in. to $1\frac{1}{4}$ in. Whit.

We have made some thousands of these Chucks during the last 11 years, every one of which has given satisfaction. For tapping holes there is nothing to equal them for speed and handiness.

Shall we mail you particulars?

J. ACKWORTHIE, Ltd.
Coleshill Street,
BIRMINGHAM

DUNBAR SPRINGS

ACCURACY ASSURED

You can always depend upon Dunbar Springs being accurate. Before proceeding with any order the first few springs are carefully tested and checked up for this very purpose.

Seventy-two years' experience making flat and spiral springs of every description enables us to furnish you with springs of the highest quality, that can be depended upon under all conditions.

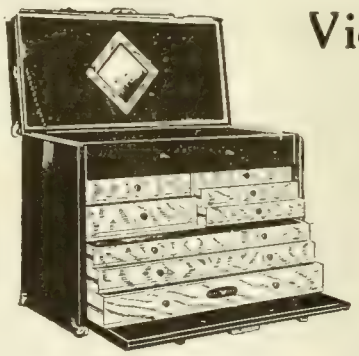
Send blue prints for estimates.

The Dunbar Brothers Co.
BRISTOL, CONN.

Machine Shop and Construction Supplies

The Rice Lewis line includes Pipe Vises and Pipe Wrenches, Micrometers, Torches, Set Screws, Cap Screws, Machine Screws, High-Speed and Carbon Drills, Files and Machinists' Tools of every description.

We also carry large stocks of Bar Iron, Sheet Iron (black and galvanized), Machine Steel, Cast Steel, High-Speed Steel, Cold-Rolled Steel.



Victor Hack Saw Blades

Durable, fast cutting blades which cut true on the toughest metals. Users find that Victor Blades cut faster and last longer than ordinary ones.

CRESCENT
BELT FASTENERS

Maintain a uniform grip, the entire width of the belt. They clinch beneath the surface on the pulley side—no part in contact with the pulley.

Machinists' Tool Chests

All Rice Lewis goods are quality products—made to give the greatest service for your money. Ask for quotations as to prices and dates of delivery.

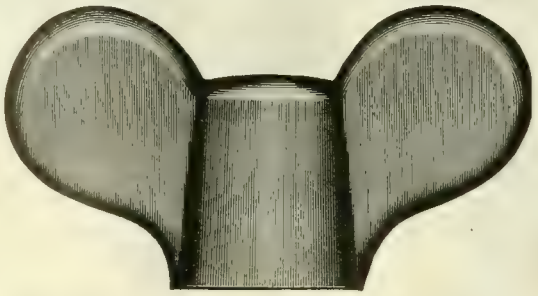
Rice Lewis & Son, Limited

Established 1847

19 Victoria St., Toronto, Ont.

CANADA
FOUNDRIES & FORGINGS
LIMITED

DROP FORGED STEEL



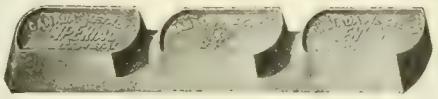
WING NUTS

EYE NUTS

All Sizes

Canadian Billings & Spencer Plant
Welland

BABBITT METALS



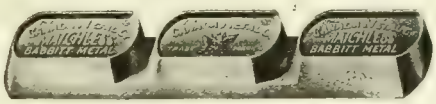
Imperial Genuine

Made for extra heavy duty, such as Main Bearings on Turbine Generators, Calender Rolls in Pulp Mills, is specially adapted for Marine Engines.

HARRIS HEAVY PRESSURE

THE BABBITT METAL WITHOUT A FAULT

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.

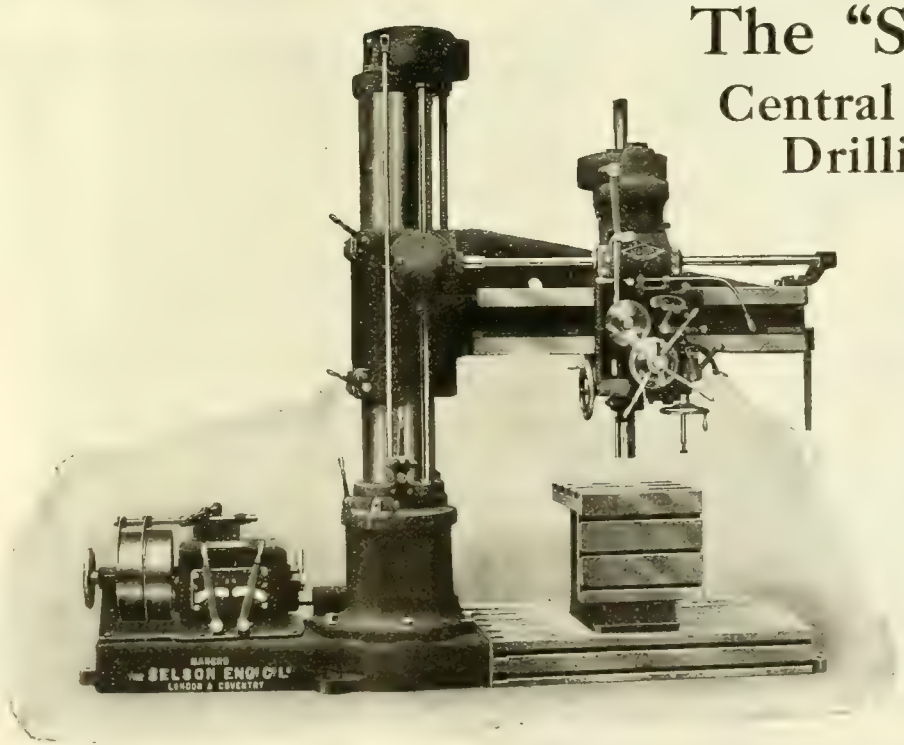


Matchless

Suitable For Slow-Moving Bearings

THE CANADA METAL CO., LIMITED
TORONTO HAMILTON MONTREAL
WINNIPEG VANCOUVER

The "Selson"
Central Thrust Radial Drilling Machine



The British Radial has found a predominant place on the markets of the World.

SELSON
Engineering Co., Ltd.

SELSON HOUSE, 83 and 85 QUEEN VICTORIA STREET
LONDON, E.C. 4, ENGLAND. WORKS: COVENTRY
Branches: Paris, Brussels, Turin, Milan, Melbourne, New York

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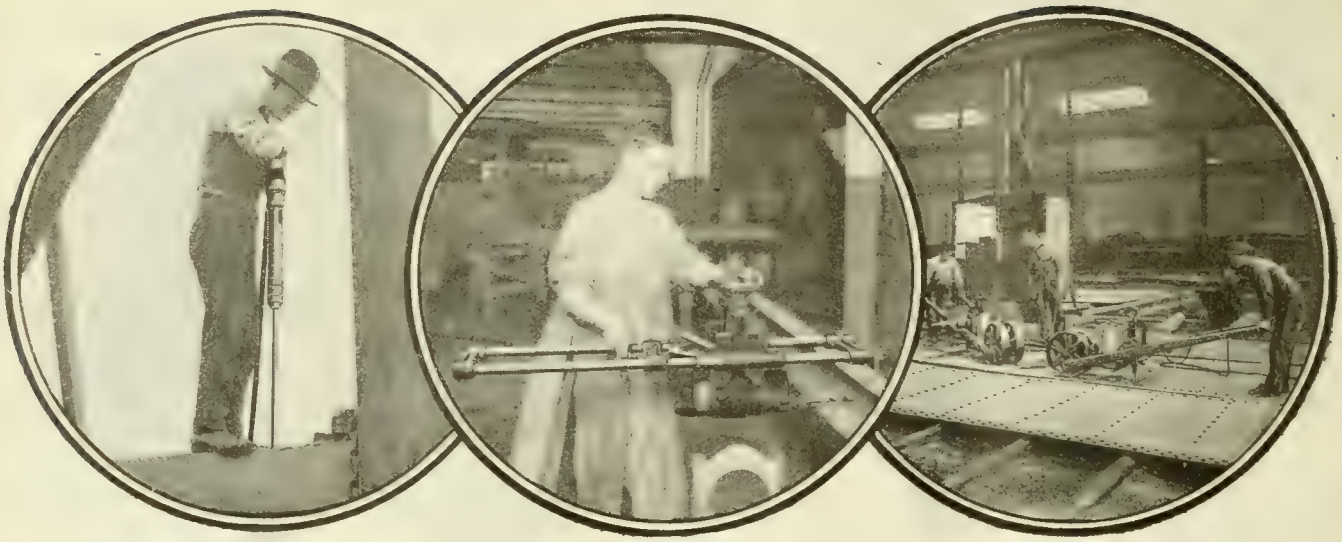


Necessity's Understudy

USERS deserve equal credit with our Service Engineers for the constant development of new uses for Boyer Riveting Hammers and Little Giant Air and Electric Drills.

In one, two, three order, three typical uses developed through their close co-operation are—

A Boyer Riveting Hammer driving drift bolts with *one* man on a two-man job. This is proof of two things: labor-saving adaptability of the tool and ingenuity in applying it, both made possible by the *powerful* Boyer stroke.

A Little Giant Portable Electric Track Drill drilling truck chassis. Supplies its own "old man," and works *six* times as fast as the portable drill it replaced, with one man less.

A Little Giant Portable Electric Drill mounted on a buggy. Almost as fast as this man can raise and lower the buggy handles, this Little Giant countersinks—an average of *9½ holes a minute.* Think of it!

Conclusion: If Necessity is the Mother of Invention, C-P Engineers are her Understudy, working first-hand with users and constantly widening the already wide utility of C-P labor-saving tools. Ask for bulletins.

Sales Representatives

The Holden Company, Limited

354-356 St. James Street, Montreal, Canada

Sales and Service Branches: TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street

Canadian Factory: Canadian Pneumatic Tool Company, Montreal

J-29H

BOYER PNEUMATIC HAMMERS · · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · · VACUUM PUMPS · · PNEUMATIC HOISTS
GIANT OIL AND GAS ENGINES ROCK DRILLS · · COAL DRILLS

CHICAGO PNEUMATIC

Depend upon *that Name*

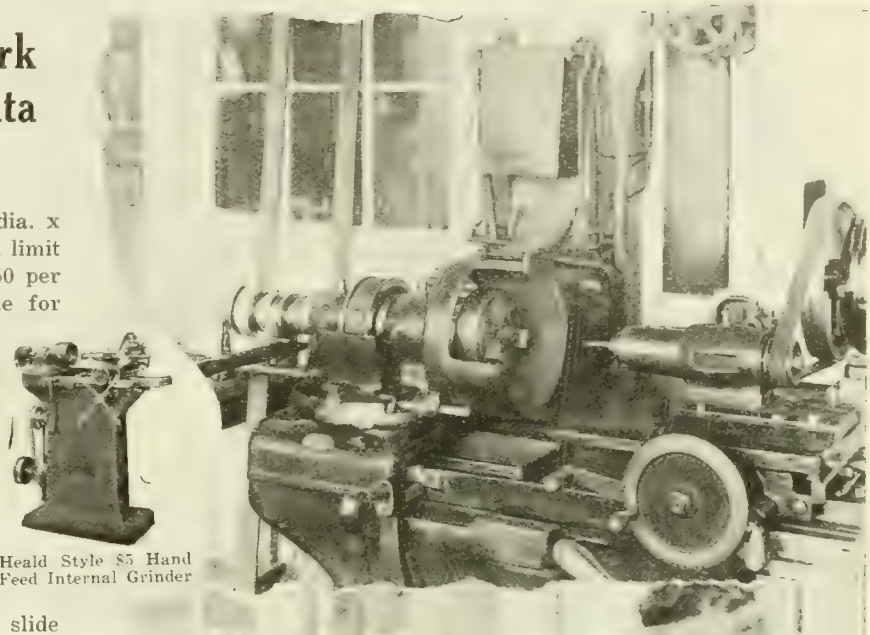
Your Grinding Problems are OURS

Send Prints of Your Work —We will Furnish Data

Small Short Work

The hole in this hardened gear is .237 dia. x ¾" long. There was .005 to remove to a limit of .0005 and a new operator turned off 50 per hour the first week. An ideal machine for work ¼ to 2" diameter x 2½" long.

How is your production on small holes?

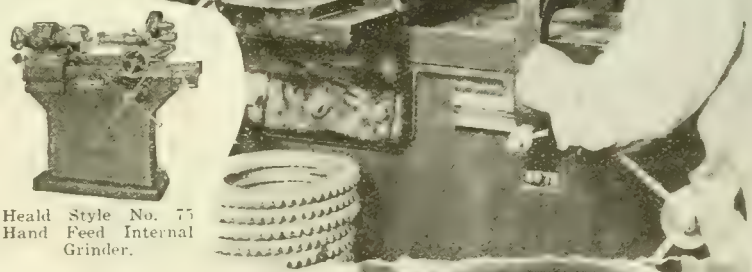


Heald Style 85 Hand Feed Internal Grinder

Hole and Face Grinding Differential Gears

Style No. 75 was equipped with a cross slide work head. The adjustment on this work head allows for quick horizontal movement when the head was drawn from the hole to grind the face. The stock on the holes ran from .020 to .030 and were ⅜" wide, finishing 6½" in diameter. The face needed about .010 to clean and was ⅞" wide. The tolerance was plus .002 and Heald turned them off at one minute fifty seconds each.

There are hundreds of internal grinding problems. Let us solve yours.

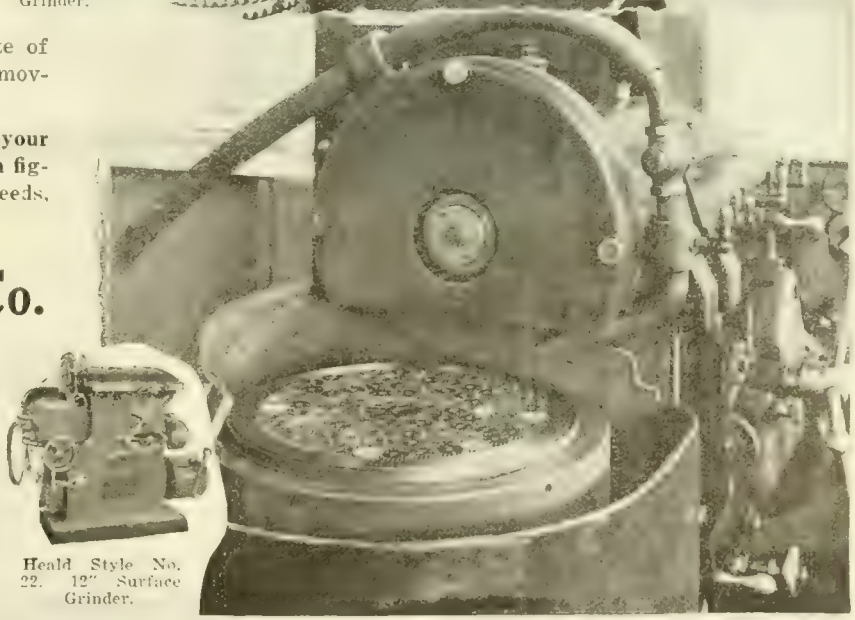


Heald Style No. 75 Hand Feed Internal Grinder.

Production—Finish Accuracy

These steel gears were ground at the rate of 400 per hour on a Heald Style No. 22, removing .005 to .010 stock to a limit of .001.

Let us prove it will be equally fast on your work. Send us 100 samples for production figures, wheels, methods of holding, speeds, limits, etc.



Heald Style No. 22. 12" Surface Grinder.

The Heald Machine Co.

51 New Bond Street

WORCESTER, MASS., U.S.A.

BRANCH OFFICES: New York, 839 Singer Bldg.; Philadelphia, 1308 Commonwealth Bldg.; Chicago, 26 South Jefferson St.; Detroit, 401 Marquette Bldg.; Cincinnati, 711 Provident Bank Bldg.; Cleveland, 721 Engineers' Bldg.; Buffalo, 331 Jewett Ave. WESTERN AGENTS: Eccles & Smith Co., Los Angeles, San Francisco, Seattle and Portland; Salt Lake Hardware Co., Utah and Idaho; Hendrie & Boltnoff Mfg. & Supply Co., Denver, Colo.

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-to specifications

SPECIAL

Screw Machine Product up to 2¼" diam.—to specifications

Special Product Hardened and Ground—to specifications

STANDARD

"V," U.S.S., S.A.E. Cap Screws

"V," U.S.S. Set Screws

Plain and Castellated S.A.E. Nuts

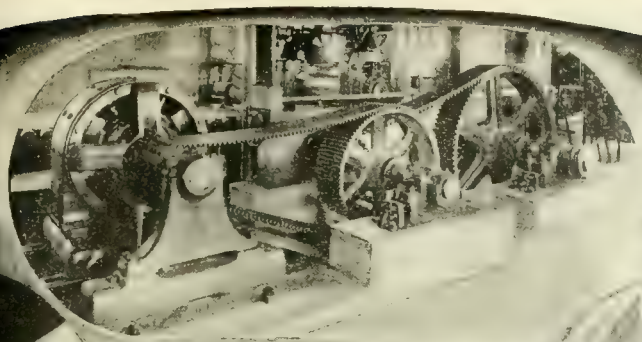
Semi-Finished "V," U.S.S. Nuts.

THE NATIONAL ACME COMPANY

MONTREAL, P.Q.

DeCourcelles G.T.R.R.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



Rolling Mill Drive reversing every Forty-five Seconds

HARD SERVICE-HEAVY DUTY-
OIL BATHS NOT REQUIRED

MORSE
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Without Slip, the Time Keepers of Production Bring out the Profits that are Concealed by the Slipping Belt.

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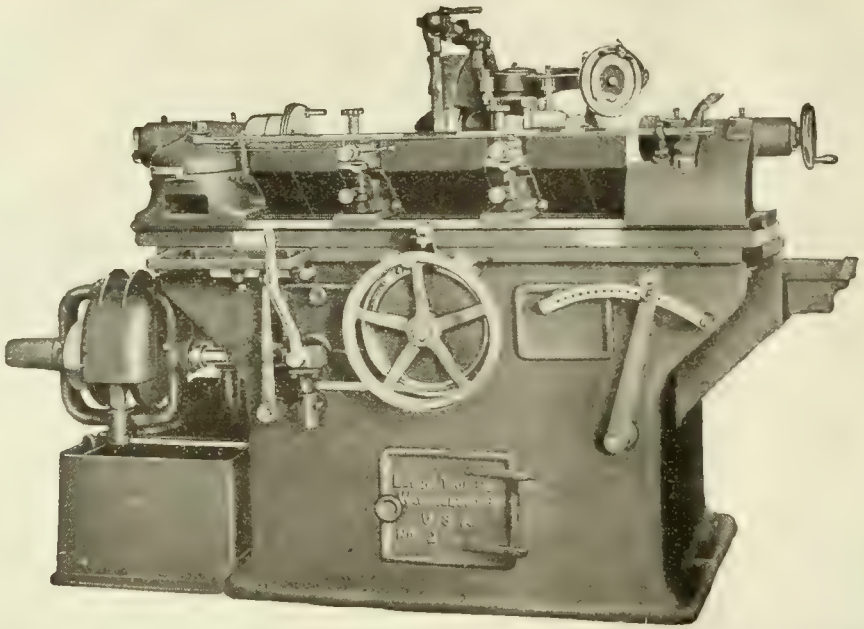

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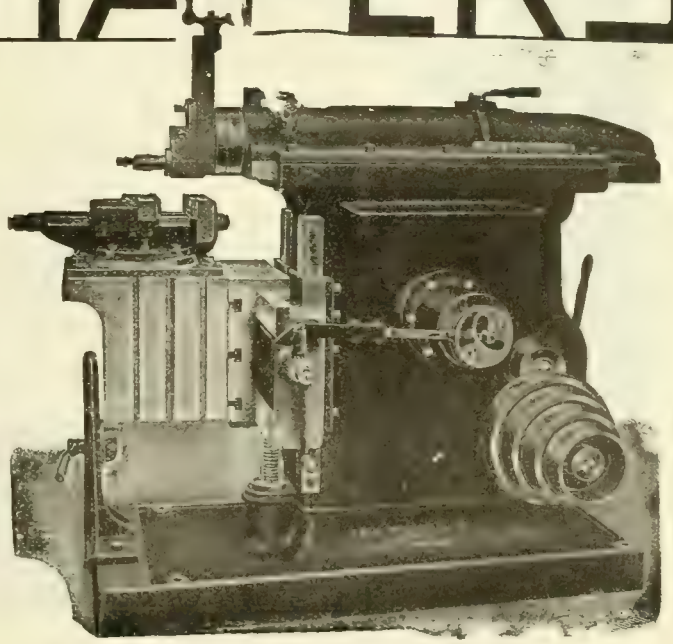

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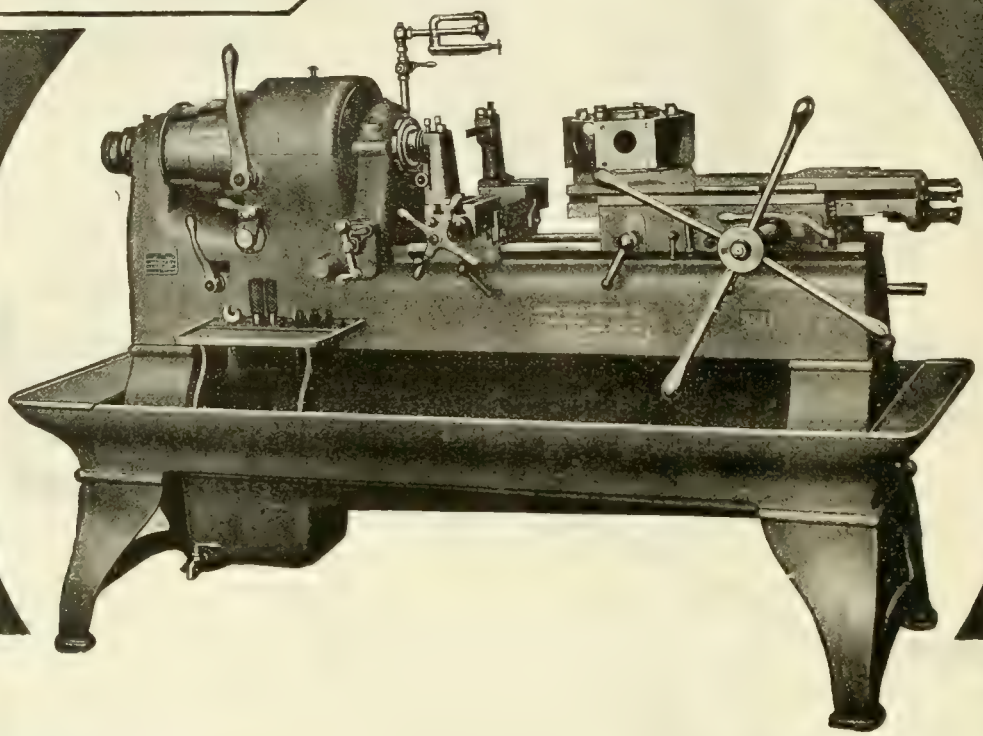

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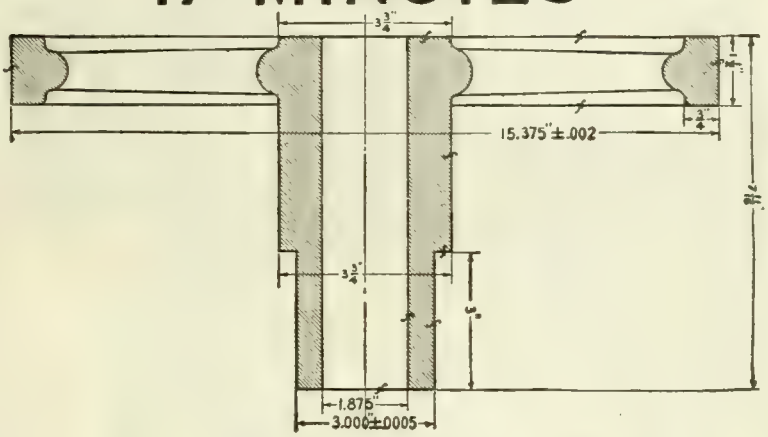

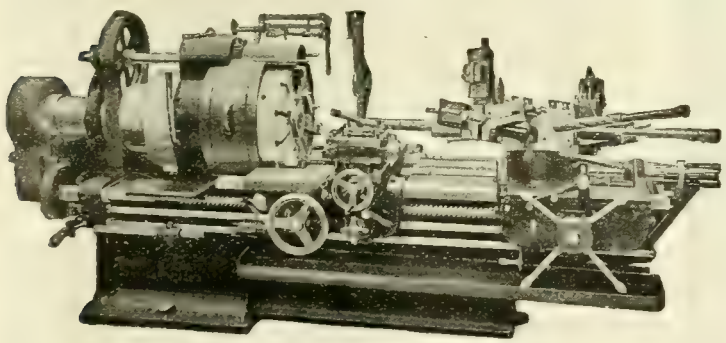

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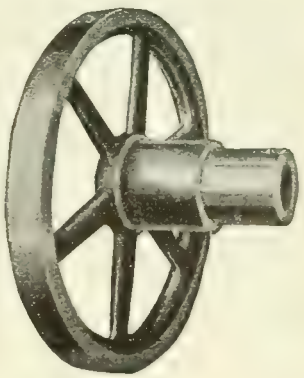

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 3 January 20, 1921

The Problem of Producing a Geneva Gear

A Tale That Will Make You Smile. It's a Mixture of Invention and Mechanics, and Brings Into Play a Scotsman, a One-legged Man, a Hebrew, Yes—and Even a Minister.

By DONALD A. HAMPSON

IN our October 26th issue we published an article dealing with the problem of machining the Geneva motion shown at Fig. 1. This problem has evidently got our readers thinking and here is how one of them would machine the piece.

The question of the Geneva gear is one that I had to answer for myself on just the same kind of a job five or six years ago. The gear for that particular purpose brings to mind a series of events such as everyone experiences when taking in model and experimental work. Your clients appear out of the thin air—their proposition or idea is as different from the previous one brought in as day is from night—you run the risk of losing some money before you get through with them, but you add **immensely** to your experience, chiefly along the line of your changed view of human nature.

When Sandy Moritz came in and wanted to hire the use of a lathe, we refused him. We always do so, and besides this gentleman was a total stranger to us. Later, he brought in several cylindrical grinding jobs which he insisted on seeing done (and even assisted in doing, when the foreman wasn't looking). All these little things, however, we laid to his Hebrew nature.

Some months later, a one-legged stranger appeared and wanted to speak to me confidentially. I told him to "shoot" right where he was, for I was able to keep any secrets he wished to disclose, but I would not entertain any proposition that was shady. Well, in a soft, cultivated voice he told me that he wished to get some work done on a mechanism that had to be guarded very jealously from outsiders who might steal the idea. He also told me that he was a retired minister, that in his work as a lecturer he had noted the ripe field for this device, which when perfected would make him independent, and the manufacturer whom they selected secure against any lack of work. I had heard all that kind of bunk before, though I was too polite to say so.

Another lapse of a month and my ministerial friend reappeared, bringing a brother minister, Dr. Morse of a local church, and his son, an insurance agent, an echo or repeater of everything the elder Morse said. They had a small package between them which the doctor, in his most unctuous voice, told me contained their machine which they would show me in private. Said machine, on being exposed, was found to be the half-finished model of a moving picture projecting machine, but the model so far had included nothing more than the film moving parts. It was explained that this machine was so much simpler and lighter than the Pathescope and other commercial types, and the films could be handled so much more readily that it would find instant sale among churches, lecturers, and societies who could not afford to buy the expensive machines that required a skilled operator.

I noted that the machine was "open side," a light plate of cast iron into which the roller and gear studs were set. This was one of the features making for easy loading. There was also an absence of toothed feeding wheels for the film. The scheme was to feed by passing the film between two friction rollers, one of which was driven by a curious looking Geneva gear. This Geneva was a "special design of their Mr. Moritz" and was to give the film a faster speed with the same dwell. I dropped the remark that I had seen an improved design of just such a gear in a recent number of a trade paper, but my friends said I must be mistaken because Mr. Moritz had originated this Geneva himself, working on it for the past eight months.

It seemed that Mr. Moritz was their engineer, engaged for the purpose of developing the picture machine, though when this was afterwards mentioned to him alone, he claimed to be an equal partner in the enterprise through his having conceived the whole thing, the others simply putting up the money. My ministerial visitors explained that they were tired of fooling along with Sandy. Frankly, they thought he was stringing the job along as a means of earning a soft living—and they wanted our place to finish the machine in a first-class manner.

If Moritz came along and wanted work done that we deemed advisable, we were to do it, but otherwise to follow instructions, and our best judgment.

A little thought applied to the design proved that it was too light for the scheme, with its feed rollers supported on studs and depending on the grip of the rollers to apply a positive movement

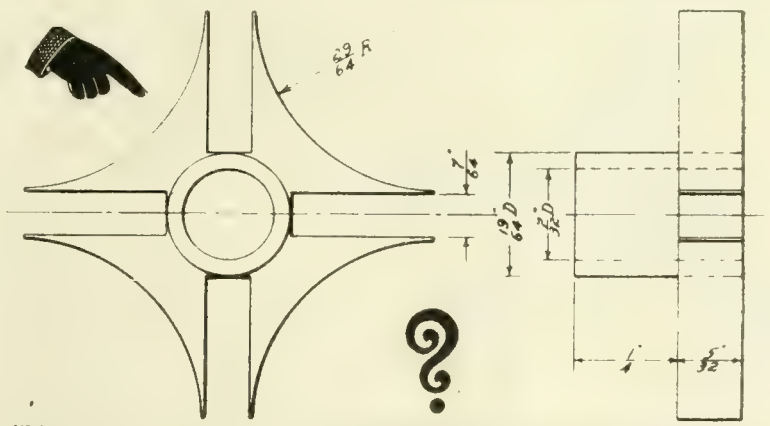
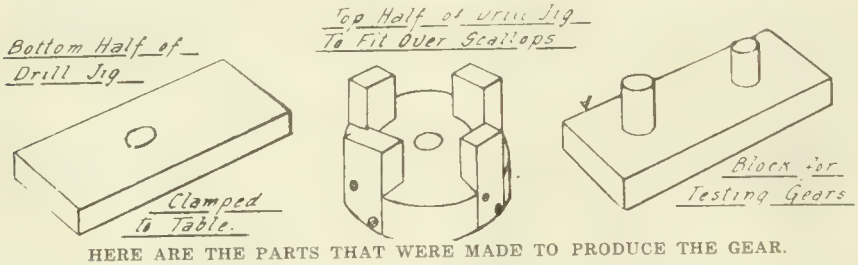


FIG. 1 SHOWING THE ORIGINAL GENEVA GEAR THAT STARTED THE TALK

to the film. We were forced to tell the trio this, but evidently they considered themselves better qualified on this point, for our objections were overruled, so we went ahead with the work. It turned out to be one of those jobs where there are loose fits and improper materials and inadequate design, where you re-make and tinker and patch, only to have a piece of junk on your hands in the end. But anyway, we made a number of demonstrations, each of which proved that the whole thing would have to be



HERE ARE THE PARTS THAT WERE MADE TO PRODUCE THE GEAR.

constructed along different lines if it were ever to be a success. The friction feed, the open side, and the hand-made Geneva all failed miserably. Even the clerical gentlemen could see this.

The Task of Re-designing

In the end, we were allowed to redesign the machine on a more practical basis. One of the men made a perspective of the proposed machine so our customers could "see" how it would actually appear. This pleased so much that we were commissioned to go ahead with some of the parts for a hundred machines, among the parts being the Geneva gears, and some pins of odd size drill rod. That drill rod is around yet. The driven member of the Geneva pair was slightly larger than the one illustrated in Canadian Machinery.

We had no trouble in producing smooth, close working parts for this purpose. We cut pieces of machinery steel five inches long, centered them carefully, turned all the shoulders or necks and turned the flange parts to the outside diameter of the points. Then we milled the slots and rough milled the scallops; the slots are the least important part of the gear and a slight inaccuracy only results in an interference with the driving roller, easily remedied by filing the mouth of the slot. Finally, with a sharp cutter and a fine feed, the half-rounds were finished to size, paying careful attention to the condition of the centers of the piece being milled.

The shaft hole in the gear was made in a drill press. A simple jig located the hole concentric with the half-rounds, with the blank lying in a cast-iron block on the table of a sensitive drill press. We concluded that this would be a more satisfactory and accurate method of making the holes in single or double blanks and cutting the latter on arbors—and we were very well satisfied with our method.

For the milling, we bought a special radius cutter from one of the well-known manufacturers of such tools. Our method of trying the work was to micrometer the pieces during the milling operation and to test the two members of a pair on a simple two-stud fixture such as is used for spur gear running tests. The operations throughout were simple, as we had planned, and we rejected but a small percentage of the pieces. We tried turning the parts out of square stock to save some milling but we found that the damage to center holes in turning affected the accuracy of the milling, so we stuck to round stock with its even cut in the lathe.

Our experience with moving picture machines might have been greatly broadened from that time if we hadn't in some way offended the promoters. It came about through Moritz's borrowing the original machine, presumably to take to their own little workshop for experimental tests. We hadn't been told not to let him have the run of things and so we let the machine go, but we had a suspicion that Sandy was trying to make a getaway and we took the trouble to phone Dr. Morse, who swore under his breath and made a bee-line for the railroad station, catching Sandy just in time. Following that episode, the former made for our place and gave us a most wonderful dressing down, polished and embellished by years of hell-fire ranting in the pulpit. We laughed.

A few days later on some pretext, they took the Geneva gears away. They already had the design of the new machine in their possession. Still later, the one-legged dominie showed up and asked for the focusing lens that we had, said lens having been brought around for measuring purposes—our design of machine having included this unit, the shutter, tripod, lights, and tilting arrangements. As we had had the lens only an hour or two, this demand struck us as funny—not so the good man, who raved most unbecomingly and muttered threats of police as he went off. Our pay? We got part of it, but the trio insisted that they should not pay for the "poor work" upon the original machine—and they didn't. We had no redress, because you can't collect much from a one-legged dominie, a minister of a city church, an insurance agent, and a Jew, all of whom are out to get rich without working—so when this combination appears in your machine shop with an invention to be developed, either insist on a drawing account at the bank or plead more work than you can handle. Dr. Morse has given up the pulpit and neighbors of the one-legged man say they are now on easy street. Sandy has permanently disappeared, from which we conclude that we gave them a fair start in business after all.

CAUSES OF CORROSION

"To my mind," said Dr. O. F. Hudson, of the Admiralty research laboratory, at a recent meeting of the Society of Chemical Industry, in Birmingham, "electrochemical is not the sole cause of corrosion in the case of copper and brass, and that in most cases, in neutral or slightly alkaline solutions, that action was relatively unimportant, the greater part of corrosive attack in these cases being due to direct chemical action. In acid liquids, and industrial waters which had a distinctly acid reaction, electrochemical action might play a more important part, but in such cases the metal, e.g., condenser tubes, failed by general thinning rather than by pitting or localized attack, which was in other cases generally the chief trouble. Electrolytic protection processes probably owed their efficiency largely to the production and maintenance of a uniform resistant scale of calcium carbonate. There was little hope of finding an alloy which would resist corrosion under all conditions.

DRILLING IRREGULAR SHAPED HOLES

The accuracy which has been attained in the drilling of square holes has led inventors to proceed still further. It is now claimed that a Hungarian named Bartholomius has a machine that is said to be free from the defects of earlier types, and is automatic in its action.

It can be attached to any boring machine, lathe, etc., without regard to the type or method of supporting of the particular machine. The device is, in fact, an independent and self-contained tool. The angular holes are drilled very accurately, as the drill is guided over the whole of its length, and the work-piece and the clamping device are in immediate contact with the guides. At the same time that round holes are being drilled, the new type of boring tool automatically drills hexagonal and polygonal holes. To obtain different sized holes it is only necessary to change the drill used. From the description we imagine it to be somewhat similar to those at present on our own market.

WELDING SOCIETY

The next meeting of the Canadian Welding Society will be held on Wednesday evening, January 26th, 1921, at 8 p.m., in the offices of L'Air Liquide Society, Suite No. 451, Confederation Life Building, Toronto. The entrance to this building is at 12 Richmond St. East, and all interested are requested to be on hand.

An Interesting Industrial Plant in Quebec

By J. H. RODGERS

THE new plant of the National Farming Machinery, Ltd., Montmagny, Quebec, contains many features of interest. This plant is engaged in the manufacture of all kinds of agricultural machinery and farming implements. A big feature in connection with this plant is the fact that not only will they make the implements, but they will produce the material used for the same, as far as possible.

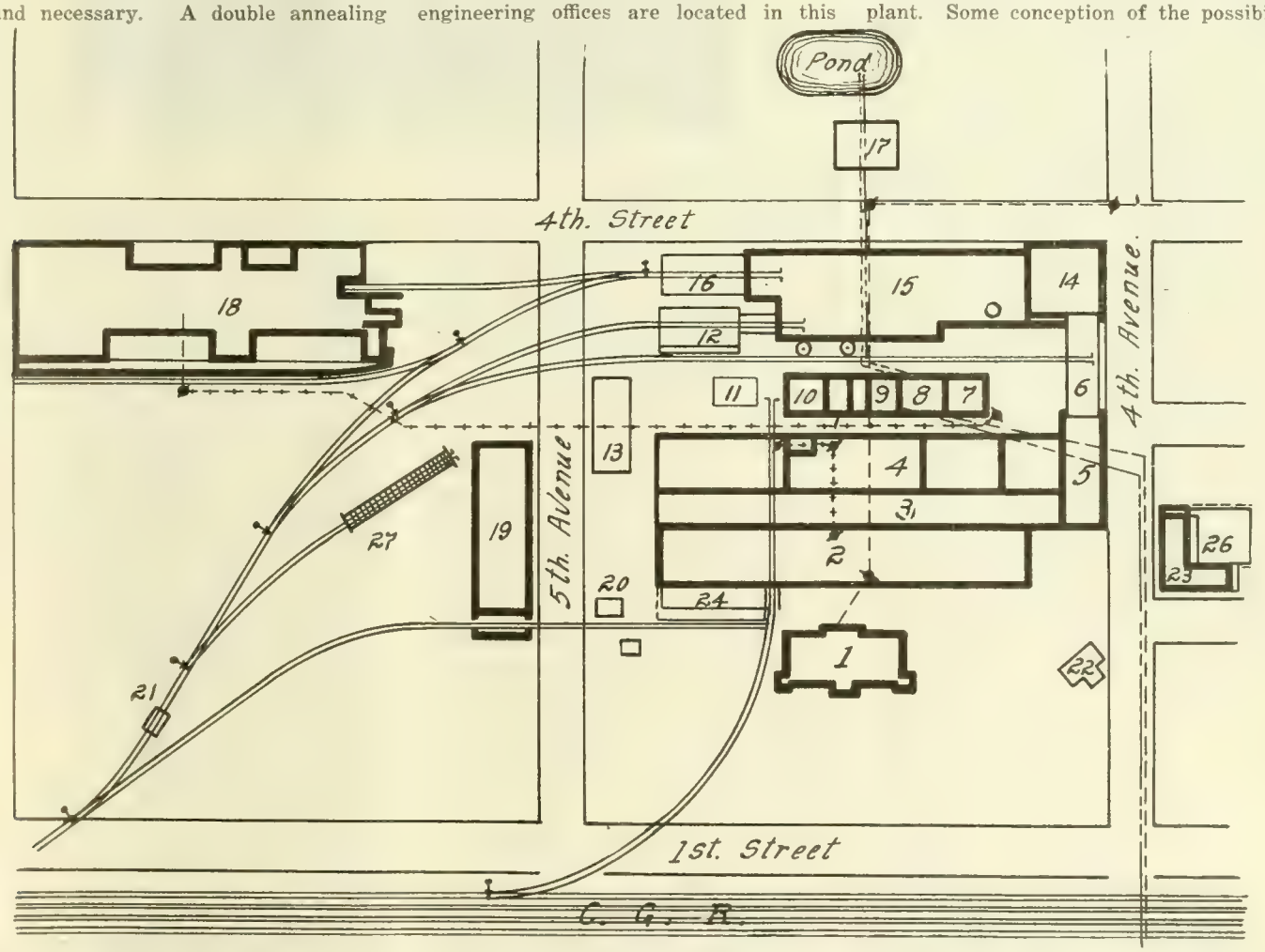
With this idea in mind they have installed a complete modern rolling mill for the necessary steel bars and shapes used in their plant.

A general plan of the entire works is shown, this view illustrates the layout of the property and the different buildings. At the rear is the foundry, 342 feet long by 115 feet wide, containing two basic open hearth steel furnaces, each one capable of producing 1,500 tons of steel per month. Foundations are also laid for a third furnace if found necessary. A double annealing oven, 20 x 10 x 10 feet, oil fired, is located alongside the furnaces to provide for the annealing of large castings. In this foundry all the steel rolls required for the mills will be cast. In addition to the steel furnaces there is a one-ton Bessemer converter, and two 5-ton grey iron cupolas. An extension is being provided, approximately 100 x 100 feet, to increase the moulding floor capacity of the cast iron section. Three overhead travelling cranes, one 50-ton and two 25-ton capacity operate in this department. The foundry is fully equipped with moulding machines, and all the latest and modern appliances for rapid and efficient production.

Administration Building

The administration building is a two-storey brick and concrete structure, situated at the front of the property and facing the main line of the Canadian National Railways. All executive and engineering offices are located in this building, and likewise adequate show rooms for the wide variety of product manufactured and sold by this company. Immediately in the rear of the general offices is the machine shop and gas engine department. This building, constructed of brick and reinforced concrete, has a total length of 450 feet and a width of 110 feet, the center portion for the complete length being designed for crane runways. A section of the machine shop, 120 feet by 28 feet, is devoted to tool room work, die sinking and metal pattern making. Every modern facility in machinery and equipment has been provided, both in the tool room and the machine shop, to augment the rapid and accurate production of every variety of work passing through the many departments.

It is interesting to note that no small number of the larger machines, used on special parts of agricultural machines, were designed and constructed at this plant. Some conception of the possibil-



This view shows the general layout of the plant. Following are the key numbers to the various buildings. 1. Administration; 2. Machine shop gas engine department; 3. Axe, pick, hammer and storage; 4. Blacksmiths' Shop; 5. Stores; 6. Boiler Shop; 7. Power House; 8. Engine Room; 9. Experimental Dept.; 10. Pattern Making and Storage; 11. Fuel Oil Storage; 12. Foundry Sand Storage; 13. Stores; 14. Rumblers; 15. Foundry for Steel, Cast Iron, Brass and Aluminum; 16. Foundry Stores; 17. Stables; 18. Rolling Mill; 19. General Stores; 20. Lumber Yard Office; 21. Track Sales; 22. Watchman's Office; 23. Printing Department; 24. Gas Engine Testing Dept.; 25. Pumping Station; 26. Machine Storage; 27. Coal Trestle.

ities of the plant may be had from the fact that the 12-inch and the 9-inch mills are being built entirely in the shop, the foundry supplying the necessary castings and the machine shop doing the finishing. To permit the work of building the mills quickly, and at a future date facilitate the repair and maintenance, a new design of mill housing has been developed by the engineer of the plant, and one of the views shows how the open side planer handles four or more of these pieces at one setting.

Gasoline Engine Department

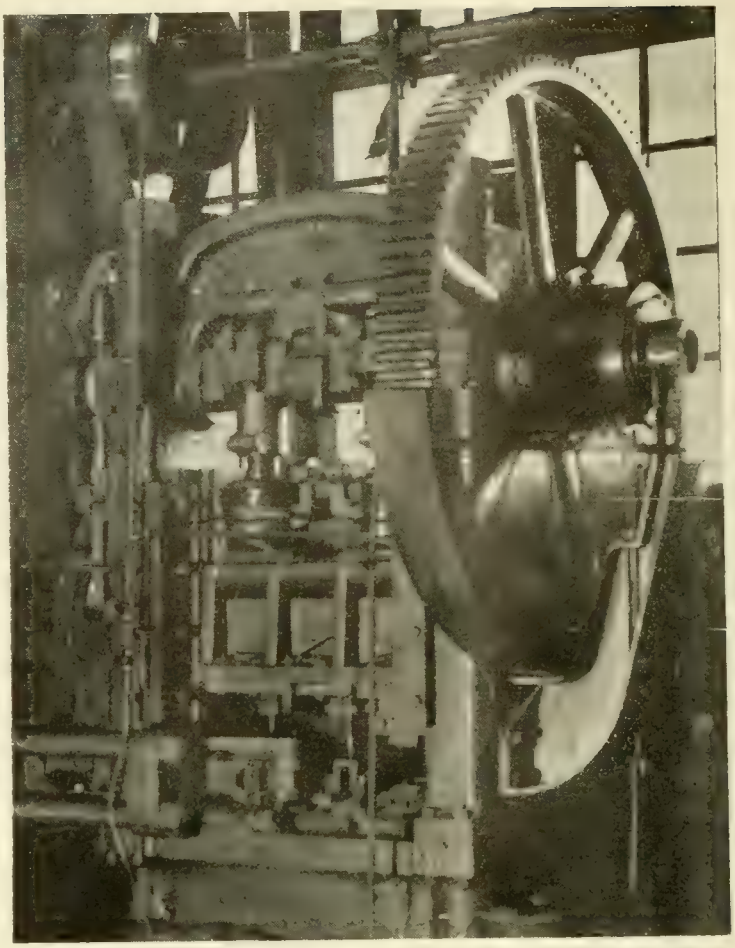
The gasoline engine department, located in one end of the general machine shop, is 133 feet by 110 feet, and the greater number of the machines are of special character particularly adapted to the duties they are to perform. The design and the development of these machines were carried out by the plant engineers. The purpose has been to provide equipment that will handle the product quickly and economically, on mass production, for the sizes of engines mostly in demand by the farming community throughout Canada, these sizes ranging from 1½ to 12 H. P. All engines are subjected to endurance tests before leaving the factory, a special building being devoted to this work. Adjoining this department is the paint section where the engines are given the final finishing touches before being crated and shipped. A railroad siding runs parallel to the shipping platform.

Immediately adjoining, and parallel to the machine shop, is the new building just completed to house the axe, plow tempering, grinding and finishing departments, together with the smith shop and the general stores. In common with other departments the equipment of the axe shop is of special design, developed by the plant engineers, and, in every way, the work produced has been highly efficient and economically manufactured. The large press shown herewith, for forming the eye of the axe, is of special interest.

The Rolling Mill

As already stated the product from the mill will provide all the necessary bar and structural material used in connection with the machinery and equipment made in the plant. The mill building, which is approximately 450 feet long by 126 feet wide, is of steel, brick and reinforced concrete construction, with a crane operating throughout its entire length, thus facilitating the handling of the material, and the placing and removal of the different rolls, and likewise the maintenance and repairs to all equipment. For breaking down the ingots a 20-inch three-roll high train is installed, operated by a 1,000 H.P. D.C. motor, driving through double helical reducing gears. The 12-inch mill, and the 9-inch Belgian mill, are operated by D.C. motors of 500 and 350 H.P. respectively. Each mill is supplied by the necessary furnaces, hot beds and finishing racks.

The foundry is casting 8-inch ingots of special steel, which are broken down in the 20-inch mill and afterwards rolled to the necessary section on the smaller train of rolls. From the mill the finished steel is placed in the steel storage department, located at the end of the main forge, being taken from there as required, cut and punched in the press department, forged and necessary lot work put on in the main forge, passing from there to the wheel and erecting section to be assembled, and then transferred, by means of a continuous elevator, to a two-storey paint department, constructed of reinforced concrete, 100 feet by 100 feet approximate dimensions. The warehouse, 225 feet by 75 feet, two storeys, adjoining the painting department.

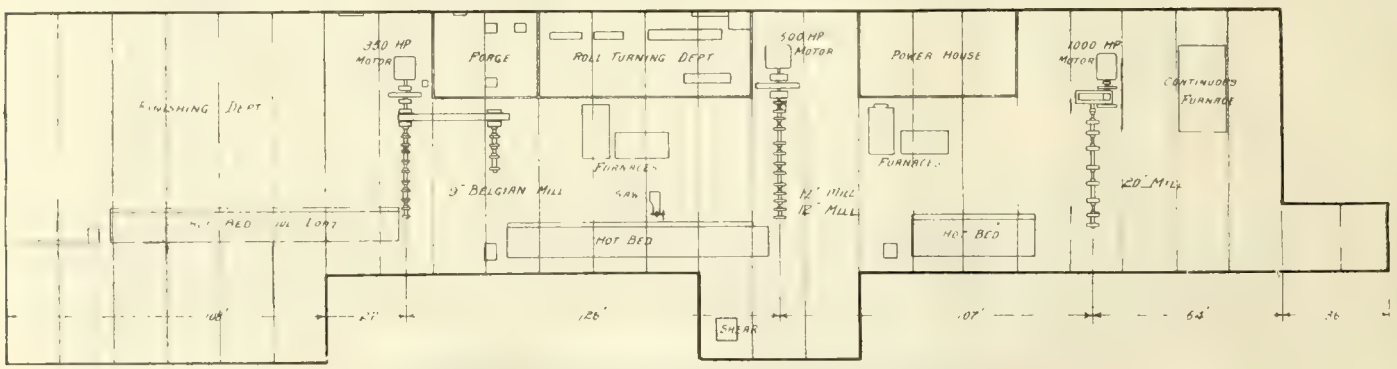


SPECIAL PRESS USED FOR PUTTING EYE IN AXES.

Boiler Department

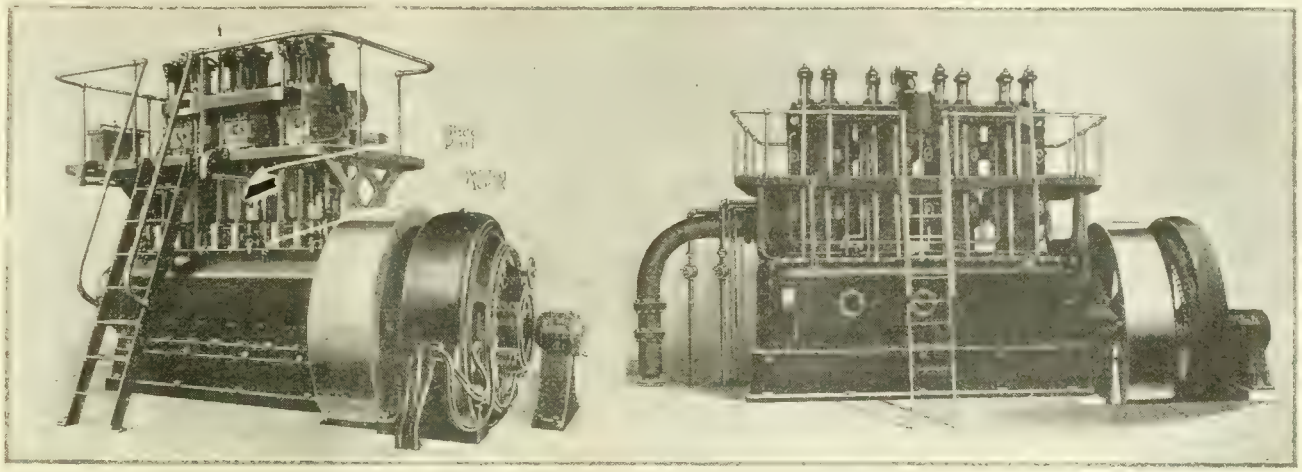
The boiler making department, now

(Continued on page 40)



INTERESTING DIAGRAM SHOWING THE ROLLING MILL LAYOUT.

A New Development of the Heavy Oil Engine



By F. A. McLean, Canadian Ingersoll-Rand Co.

FOR power plant service the advantages obtainable from the use of oil engines are briefly: simplification of equipment, a reduction in labor charges, the elimination of standby losses, a saving of space—due to the absence of boilers and accessory equipment—and a simpler and more convenient fuelling problem, representing in their entirety a much lower cost for power output.

Plant owners and engineers have paid close attention to the story of oil engine development, which within the last few years has been one of gradual transition from the Stuart or Diesel type, with its well-known high fuel economy, but poor flexibility in starting and stopping, and necessity for operating on high temperatures and at high pressures, with consequent trouble, due to the inability of the metals obtainable to stand the severity of the service.

Following this came the development of the so-called Semi-Diesel type, which eliminated some of the complications of the earlier type, but introduced others that are equally undesirable. In comparison with the Diesel type it has a much lower operating economy; consumes more lubricating oil; is difficult to start, and requires the use of a blow torch for the preliminary heating of a hot plate, cap or bulb, for ignition purposes.

Numerous attempts have been made by different designers to overcome the objectionable features of both the Diesel and the Semi-Diesel types and to develop a low compression engine possessing high operating economy.

The Ingersoll-Rand Company along with others entered this field, made an extensive study of heavy oil engines and, as a result of their researches and experiments, recently placed on the market a line of stationary and marine oil engines of a distinctly new type.

These new engines are different from any other oil engine on the market, being neither of the Diesel nor Semi-Diesel type, although it is asserted that they possess the advantages of each type with none of their disadvantages. They are known as the Ingersoll-Rand, Price Rathbun type, heavy oil engines, and operate with highest economy on a new principle, which permits their simplification to a remarkable degree. Engineers who are familiar with the extreme simplicity of the ordinary gas engine, can well appreciate what has been done in this line.

In the past, heavy oil engines of high economy have operated on cylinder compressions of between 500 and 600 pounds air pressures of approximately 1,000 pounds per square inch being used for the injection of fuel, thus requiring the use of a two or three stage air compressor attached to the engine itself, or separately driven. In either case the power required to operate them amounted to at least 10 per cent. of the total power output and they required considerable attention on the part of the operating force. All this troublesome and inefficient air injection equipment has been eliminated in this new engine, and it has demonstrated some things heretofore considered impossible.

In a rigid 72-hour test conducted a few months ago a three-cylinder engine built for central station service in Cuba showed at full load an average fuel consumption of 0.425 pounds of fuel per brake horse-power hour, with a compression pressure of less than 200 lbs. per square inch. At three-quarters load the average fuel consumption was 0.45 lbs. and at half load 0.51 lbs., the oil used being of 28° Baume. In considering the fuel economy of this engine (approximately 0.4 lbs. per brake horse-power hour), it is interesting to remember that in marine practice it has been customary to give fuel economies on the basis of indicated horse-power, and inasmuch as the mechanical efficiency of a Diesel engine is about 75 per cent., 0.4 of a pound per brake horse-power is equivalent to 0.30 lbs. per indicated horse-power hour for the Diesel engine.

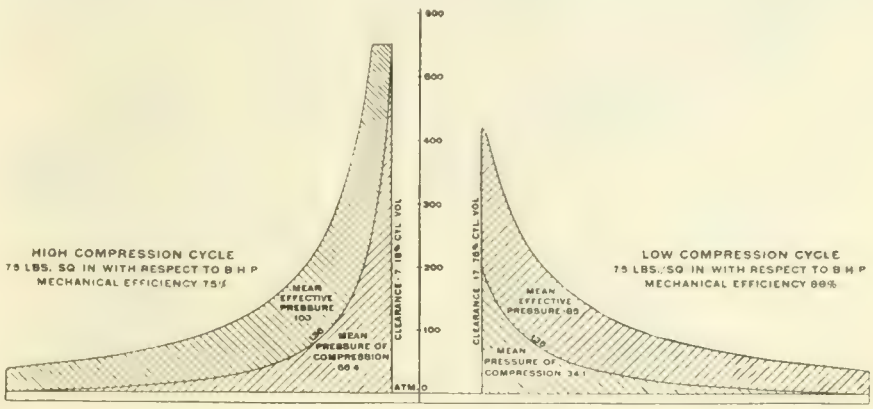


FIG. 1 DIAGRAM ILLUSTRATING MARKED DIFFERENCE BETWEEN HIGH AND LOW COMPRESSION CYCLE.

In other words, the Diesel engine would have to operate at 0.30 lbs. per indicated horse-power hour to equal the figures given for the new engine.

Cycle of Operation

The engine operates on the four-stroke cycle, with low compression (approximately 200 lbs. per square inch), with direct fuel, or as it is sometimes termed, solid fuel injection, and is absolutely independent of hot tubes, bulbs, caps and starting torches, nor is it a surface ignition engine.

The inlet valve is opened mechanically and the piston travels downwards on the suction stroke, drawing in a full charge of pure air. The intake valve is closed by its spring and the piston returns, forcing the air from the cylinder into the combustion chamber and compressing it to a pressure of approximately 200 pounds per square inch.

Injection of fuel starts near the end of the compression stroke and is completed before the piston reaches the end of its travel. Perfect working stroke combustion at constant volume occurs almost exactly at dead centre, the pressure rises from 200 to approximately 400 lbs. and the piston moves downward on the working stroke.

Near the end of the working stroke the exhaust valve is opened mechanically, the pressure drops, and the piston expels the burnt charge on its return.

Various Cycles

The cycle of this new P. R. engine is closely related to that of the ordinary four-cycle or automobile engine, and the marked difference between this cycle and that of engines of the high compression type is clearly indicated by Figure 1, while comparative indicator cards for the Diesel, the Ingersoll-Rand, and a Corliss engine are shown in Figure 2. It will be noted that the cycle of the new engine falls in between the Diesel and Corliss engine cycle. The ratio between the amount of work delivered by the engine and the amount of work done in the engine cylinder during the compression and expansion strokes is 35 per cent. for the Diesel, 49 per cent. for the Ingersoll-Rand, and 75 per cent. for the steam engine. This ratio may be called "The co-efficient of durability" or "power factor" in the same sense as the expression is used in electrical computations. An alternator which has a power factor of 75 per cent. is performing within itself 100 units of power, of which 75 units are available for use. The life of an engine, the cost of lubricating oil, repairs and attendance required is indicated by this power factor or "co-efficient of durability." In other words we have the Corliss with a high power factor of 75 per cent. lasting for very long periods and requiring very little lubricant, repairs or attention. Next comes the new engine with its power factor of 49 per cent. indicating that it will last 40 per cent. longer and require correspondingly less lubricant and attention than the other, with its 35 per cent. power factor.

Advantages of Low Compression Cycle

In the Ingersoll-Rand cycle, as already mentioned, the compression is carried to approximately 200 lbs., when combustion at constant volume occurs, raising the pressure to about 400 lbs., at which point almost perfect adiabatic expansion begins. In the high compression type the pressure is carried about 500 lbs. and oil is admitted gradually, so as to produce combustion at constant pressure until the piston has travelled a portion of its stroke, from which point expansion begins. Thus there are four points of particular advantage in the low compression cycle.

First, a lower ignition temperature is required, due to the elimination of the refrigeration action of the injection of air in the Diesel engine, as it expands from 1,000 pounds per square inch down to the cylinder compression pressure. Second, the engine we are discussing does not require an air compressor for fuel injection, friction losses are lower, and—due to its higher mechanical efficiency—the mean effective pressure which is proportional to the net work developed in the engine cylinder for the same brake horse-power of engine need only be 85 per cent. of that of the high compression cycle.

The mean pressure of compression which is proportional to the work done in the engine cylinder during the compression stroke is approximately half that of the high compression cycle, and although it is true that this work is not lost, but returned to the piston during the expansion stroke, nevertheless the performance of this extra work of compression by the piston and the return to the latter of an equal amount of excess work during the expansion strike represents considerably more wear on the piston, cylinder and bearings. For equal brake horse-power the low compression cycle subjects the engine to about 30 per cent. less wear. Parts of equal dimensions will therefore wear considerably longer and require much less attention.

As previously mentioned, the new engine is free from hot caps, tubes, bulbs, uncooled apron castings, etc., an electric igniter being used for the first few ignitions when "starting cold." The absence of hot caps or hot surfaces of any kind is of great advantage in eliminating overheating troubles at full load and underheating troubles at light loads. As there are no highly heated parts, a full charge of air can be drawn in, instead of heated, expanded, and reduced in volume. This is one of the ways in which the higher power attained with this engine for a given piston displacement may be accounted for. The splitting of hot caps is eliminated, the absence of starting torches reduces the fire hazard, and tends to make a cleaner and cooler engine room. The engine being comparatively cool at all points, the operator is enabled to attend to it with greater ease.

Fuel Supply and Injection

A pump driven from the engine elevates the oil from the main supply to a filter of special construction located at one end of the platform from which the oil is fed to the fuel injection pumps by gravity. The fuel injection pumps, one for each cylinder, are mounted on the housing near the cylinders and operated by cams from the side shaft, which also drives the centrifugal governor used to control the amount of fuel injected and vary the intake of air so as to maintain

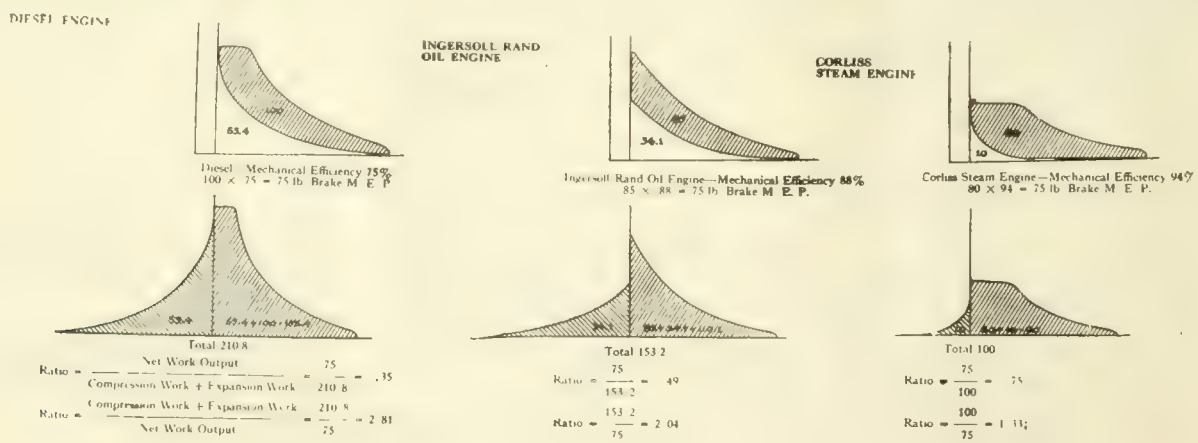

DIESEL ENGINE
INGERSOLL RAND OIL ENGINE
CORLISS STEAM ENGINE
Diesel Mechanical Efficiency 75%
100 × 75 = 75 lb Brake M E P
Ingersoll Rand Oil Engine—Mechanical Efficiency 88%
85 × 88 = 75 lb Brake M E P.
Corliss Steam Engine—Mechanical Efficiency 94%
80 × 94 = 75 lb Brake M E P.
Total 210.8
Total 153.2
Total 100
Ratio = Net Work Output / Compression Work + Expansion Work = 75 / 210.8 = .35
Ratio = Compression Work + Expansion Work / Net Work Output = 210.8 / 75 = 2.81
Ratio = 75 / 153.2 = .49
Ratio = 153.2 / 75 = 2.04
Ratio = 75 / 100 = .75
Ratio = 100 / 75 = 1.33

FIG. 2—CHARACTERISTICS OF DIESEL, INGERSOLL-RAND AND CORLISS ENGINE CYCLES COMPARED.

the cylinder temperature under various loads.

Fuel is injected by the fuel pumps without the use of air injection equipment and the economy is said to be just as high, or even higher, than that of the most complicated air injection engine.

The question that will naturally be asked is this: How does the engine operate without injection air? The answer is simple: The fuel injection system used reduces the fuel to such extremely small particles that a tremendous amount of oil surface is exposed to the action of the increasing temperature obtained during the latter part of the compression stroke. The fuel injection system thus pulverizes the fuel to a "fog cloud" and at the same time obviates the impingement of the oil upon the walls of the combustion chamber.

So perfect is the "fog cloud" formed that it has been found possible to inject the oil with the engine at rest, allow the fog cloud to dissipate and then demonstrate that the walls of the chamber were perfectly dry. The fuel sprays are located at diametrically opposite points on the combustion chamber, so that they are not only balanced against each other, but the resulting motion of the "fog cloud" after impact is opposed by the air coming up through the passage from the cylinder to the combustion chamber, as will be noted by referring to Figure 3. Injection of the fuel begins about 40 degrees before compression dead centre and ends about 10 degrees before compression dead centre.

High Fuel Economy

A statement that one sometimes hears from those who do not realize that economy and dependability are intimately related is that, since the fuel cost of an oil engine is so low, a gain in economy is a small factor, dependability being the principal requisite. Every heat unit in the fuel, however, that is not transformed into useful work must be dissipated in some way. Either through the walls of the combustion chamber or through the cylinder walls to the water in the jacket, or else it is carried past the exhaust valve and its seat during exhaust, or it may disappear as friction in the bearings or cylinders with consequent bad effect on the upkeep and durability of the engine.

If the engine is inefficient, not only is a large percentage of useful fuel wasted, but in getting rid of the waste heat more or less rapid deterioration results. The waste oil must be added to the fuel bill, or paid for in additional lubricating oil required to preserve the oil film on the overheated piston and cylinder walls; or else paid for in the increased amount of cooling water required to dissipate the waste heat and ultimately in engine upkeep. High fuel economy means, therefore, low fuel cost, low lubrication cost, low cost of cooling water, lower cost of repairs and longer engine life.

It is perhaps needless to say that when an oil engine operates at such high economy as does the type described, no carbon will be deposited in the cylinder and that the exhaust will be practically colorless. The cylinders of these engines after long periods of continuous operation are said to look as clean and bright inside as do the cylinders of a high-grade steam engine, and the piston and rings also remain bright and free.

General Description

The Ingersoll-Rand "P.R." stationary oil engine is of the vertical multi-cylinder, single acting, four cycle type and is offered for general power plant service for either belt or direct connection to alternators, direct current generators, or other classes of machinery. It is said to be especially suitable for driving alternating current generators in parallel and is built at present in seven sizes, with capacities of 105 to 480 brake horse-power. It consists essentially of a heavy base or bed plate, to which is bolted a housing carrying the cylinders with their heads, manifolds and fuel injection pumps.

Base and Housing

The bed plate is of heavy construction and simple design, cast so as to form a reservoir for the lubricating system. Ribs and broad flanges give rigidity and ample bearing on the foundation. The crank shaft bearing pedestals are also cast integral with the base, as can be noted by referring to Figure 4. The housing which encloses the driving parts and forms the top half of the oil reservoir is a strong ribbed casting provided with ample means for gaining access to the interior. Doors placed at the back directly opposite the crank throws permit easy inspection or adjustment of the driving parts, while a single cover bolted to the front of the engine and supported on swinging hooks, trolleys and slide rails suspended from the platform, permits access to the side shaft, governor, eccentrics, etc. This arrangement is shown in Figure 5. Working stresses in the housing are eliminated by the use of stay bolts or tie rods, which transmit the working stresses from the top of the housing to the bed plate.

Main Bearings

Four bearings are used on the three cylinder engine and five on the four cylinder size, and as there is perhaps no other one feature in the design of the vertical multi-cylinder oil engine that has more to do with its mechanical upkeep, the main bearings of the engine have been designed along lines which ensure true and permanent alignment, and provide for quick and easy adjustment. As shown in Figure 4, the bear-

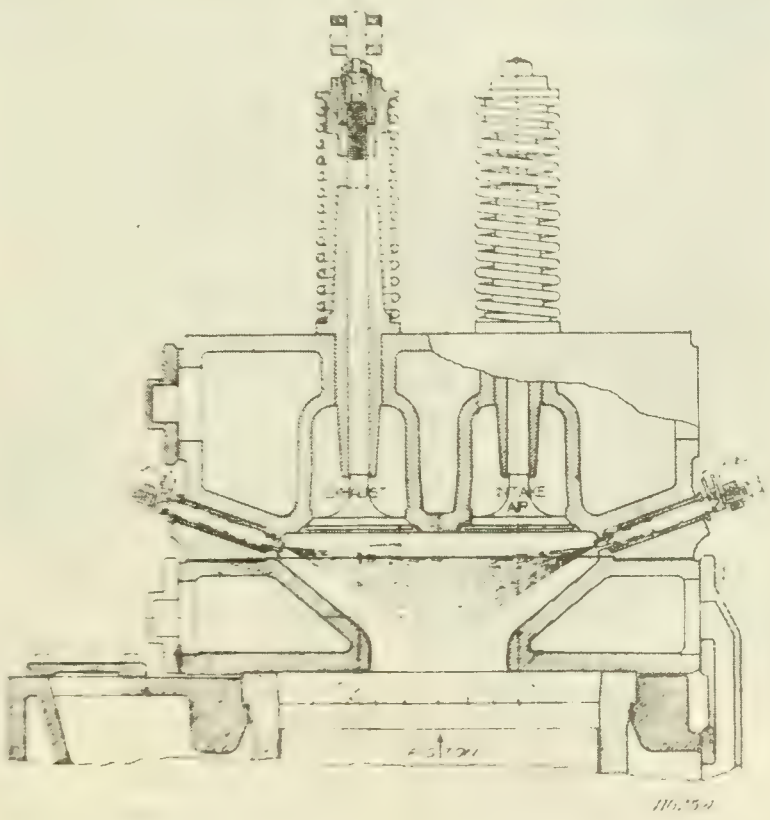


FIG. 3—CROSS SECTION OF COMBUSTION CHAMBER SHOWING LOCATION OF FUEL INJECTION NOZZLES AND MOTION OF FOG CLOUD.

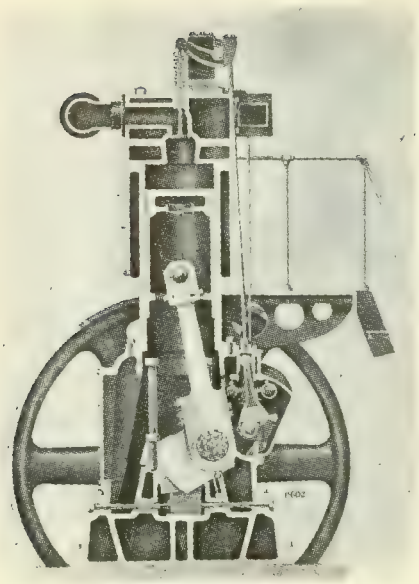


FIG. 1.—CROSS SECTION OF P. R. STATIONARY OIL ENGINE.

ing caps are bolted securely to the bed plate; the bottom halves are held rigidly sidewise in the bed plate and supported on wedges which are adjustable from the outside by wedge bolts. By shifting the wedges the bottom half of each bearing may be raised until the shaft is brought into contact with the firmly held bearing caps, securing perfect alignment. The wedge bolts are then tightened and prevent further movement. By removing the wedge and bolts any one of the lower bearing caps can be taken out and renewed without disturbing the other parts of the engine.

Cylinders and Heads

The cylinders are semi-steel castings, well water jacketed and supplied with conveniently located clean-out holes. The cylinder and cylinder head water jackets are connected by outside manifolds in place of the more usual jacket to jacket connection. This permits the use of metal to metal joints and eliminates troublesome gaskets and packing at points of high pressure.

Cylinder heads are in two parts, the intermediate head forming the combustion chamber and carrying the compressed air starting valve and starting element and the main head, containing fuel injection, nozzles, air inlet and exhaust passages and valves.

Pistons

The pistons are cast from a special material designed to withstand wear and avoid warping. They are carefully finished and fitted with a "fire" ring near the top, three beveled rings held by bevelled segments and flat springs near the middle and a wiper ring in the skirt. The latter prevents an excess of crank case oil entering the cylinders, or used cylinder oil entering the crank case. Surplus lubricating oil in the cylinder is conveyed to a separator and vented to the atmosphere.

Valves and Valve Motion

Valves are of the poppet type located in the head, as previously mentioned and are operated through a valve motion known as the "roller path type" from eccentrics mounted on the side shaft. Timing of the valves and fuel injection is obtained from this side shaft through the medium of a pair of spur gears driven by the crank shaft and the entire valve motion and timing mechanism works smoothly and quietly.

Crank Shaft and Connecting Rods

A solid one-piece steel forging is used for the crankshaft, ensuring uniform strength and stiffness. The connecting rods are forged from mild steel with a solid eye and adjustable bronze box at the wrist pin and a babbitted steel half box and a babbitted steel strap bolted and keyed to the rod at the crank pin end.

The Fly Wheel

The flywheel is of the split hub type, massively constructed and acts as a strong and rigid coupling between the main shaft and the extension shaft, the dimensions of which vary according to the requirements of each installation. A self-aligning outboard bearing provides additional support for the extension shaft.

Lubrication

As previously mentioned, the bed plate and housing are arranged to form a reservoir for the automatic lubrication system. Adjustable dippers on the connecting rods dip into the oil at each revolution and drench the working parts with oil. Troughs on the inside of the housing catch part of the oil and convey it through pipes to the main bearings. In operation, oil from an elevated filter is supplied to the main bearings through open sight feed oilers, insuring a constant supply while the engine is running. The oil level in the base is adjustable and the overflow is returned to the filter by a small pump.

Starting

Electric ignition—by means of a small element in the combustion chamber, heated to a dull red—is employed for the first few revolutions, when the engine is absolutely cold, while compressed air from a tank under pressure of 150 pounds is admitted to each cylinder in succession by means of mechanically operated starting valves and serves to turn the engine over. As the engine is turned over fuel is injected and after a few revolutions the air and ignition are cut off and the engine continues to ignite entirely by compression. Where compressed air and electricity are not available for starting purposes they are usually provided by a small gasoline or kerosene oil-driven compresser and a belted generator.

FARM MACHINERY PLANT

(Continued from page 36)

temporarily installed in the press shop, has been responsible for the fabrication of all the columns and roof trusses and general steel work necessary in the construction of the new buildings, as well as the steel flume pipe for the electric development power station that supplies the rolling mill with power. This hydro-electrical development consists of a concrete dam 150 feet wide by 75 feet high, 1,700 feet of wood stave pipe, 6 feet in diameter, and 360 feet of steel pipe between the dam and the power house, which is situated 20 miles from the plant. This dam was completed on the 4th of December, 1920, and it is estimated that the power station will be completed and current delivered by the middle of January. This work has been carried out by the Corporation D'Energy de Montmagny, F. L. Gagon being the consulting engineer; the latter is likewise chief engineer of this company.

The electrical current will be delivered to the rolling mill power house at 55,000 volts, there transformed down to 550 vots and then, by means of Westinghouse rotary converter to 250 D.C. for the mill motors and cranes. The electrical power for the shops is generated by the plant's own power house. Three Wickes vertical boilers are installed for this purpose, each with a rated capacity of 300 H. P. The electric equipment consists of two 500 K. W. General Electric generators, driven by Bellis and Morcom compound steam engines; one 1,000 K.V.A. rotary turbine generator made by the Allis-Chalmers Company, excited by a Westinghouse motor generator set. There is likewise one D.C. generator driven by a Curtis turbine. Connection is made from the local power plant to the rolling mill switchboard so as to provide for the operation of the mill in case a breakdown occurs along the transmission line from the hydro-electric plant.

The forge shop, containing rope, board and steam drop hammers, Bradley hammers, bulldozers, upsetters and bending machines, rake tooth furnaces and tempering tanks, is designed to handle all classes of work comprised in the agricultural line.

The wood working section of the plant's operations is at present being carried on in a building somewhat removed from the main works, but a site has been allotted near the new rolling mill for a thoroughly up-to-date wood working shop and drying kilns, and it is the intention to proceed with this structure as soon as the snow is off the ground.

A malleable iron foundry is also in course of construction which will supply all the malleable iron castings required for the various implements.

From the foregoing description it will be seen that this plant, with the exception of fuel and raw materials, is practically self contained. At a later date we intend showing interesting operations as performed on this class of machinery.

Calculating Foundations for Machinery

Causes of Vibration—Vibration as Affected by Degrees of Freedom—Vibration in a Body With One and Two Degrees of Freedom, and the Basis of Foundation Design

By N. W. AKIMOFF

THE WEIGHT of the Great Pyramid is approximately 5,274,000 tons, its base is 764 ft. square, and its height about 486 ft. It is built on leveled rock. The Washington Monument rests upon a bed of fine sand 2 ft. thick. The piers of Brooklyn Bridge are founded 44 ft. below the bed of the river upon a layer of sand, 2 ft. thick, which rests upon bedrock. The massive St. Isaac's Cathedral, Petrograd, is built on a swamp, and the piling has been so carefully proportioned that the exceedingly heavy doors of the cathedral swing easily, whereas the slightest lack of uniformity in settling would doubtless lock them. These well-known structures are here mentioned by way of illustrating the obvious purpose of the foundations upon which they rest. The object of such foundations is double: (1) To distribute the load in as nearly uniform a manner as possible; and (2) to secure uniformity in settling, it being a well-known fact that all heavy structures settle, some to a considerable extent, 6 to 12 in. and sometimes even more.

Just how all this applies to foundations for all sorts of machinery, and in particular to rotative machinery, is not easy to say. Indeed, the weight, say, of a large pumping engine or of a turbo-generator outfit is generally much lower per square foot of floor space occupied than the limits prescribed by municipal laws or building ordinances, and furthermore, uniformity of settling of a relatively small volume of this nature (substructure plus engine, etc.) can be secured without going to the extremes usually observed in designing footings for buildings.

What, then, would be the general governing idea in proportioning a foundation, say, for an engine of a given type? Should it be heavy or light? Should it be deep, resting on rock or sand if possible? Should it be independent of the footings of the building, or would it be desirable to tie it to the latter?

By examining the existing records we can find a great variety of rather contradictory answers to each question, but the predominant idea in the mind of the designers appears to be somewhat as follows: Since the engine is likely to vibrate, let us tie it as firmly as we can to the earth itself. The mass of the earth being practically infinite, the amplitude of the resulting vibration will probably be zero. The designer may be utterly unconscious of this reasoning, but he applies it through instinct or "horse sense" and gets results which sometimes are satisfactory and sometimes exceedingly poor.

It is especially interesting to see how the same designer, having decided to provide as solid a foundation as practical considerations allow, will often unconsciously neutralize his whole theory by such means as: (a) resting the foundation upon a layer of rubber, cork, felt, or other yielding material (see Fig. 1, A and B); (b) providing a space between the foundation of the walls of the building and filling it with sand (if the foundation is so heavy and so deep as to secure immunity from vibrations, why fear its contact with the walls?); (c) using various pads, buffers, cushions, etc. (see Fig. 1, C and D), which, if at all yielding, of course tear to the ground the very idea of solidity of the foundation of the earth.

Causes of Vibration

A rational basis on which to work is thus seen to be lacking and it is accordingly the object of this paper to point out some definite lines along which a rational theory of substructures for engines and moving machinery can in general be built up. To begin with, it is important to realize that vibrations are caused by two distinct orders of agencies: (1) Those due to unbalance, or, more correctly, lack of running balance; and (2) those due to causes other than unbalance.

As regards unbalance, it may be said that this can be so easily corrected in the construction of machinery that all specifications should invariably call for perfect running balance at all speeds, that is, complete absence of tremor or of "periods" under all conditions. The writer feels that such a complete practical solution of this problem of balancing has been offered by him for bodies of all kinds that there is now absolutely no excuse for the manufacture of unbalanced machinery. However, there are many causes quite independent of balance, each of which is likely to result in vibrations, as for instance, "whipping" of a slender body (crankshaft, arma-

*Paper presented before American Society of Mechanical Engineers.

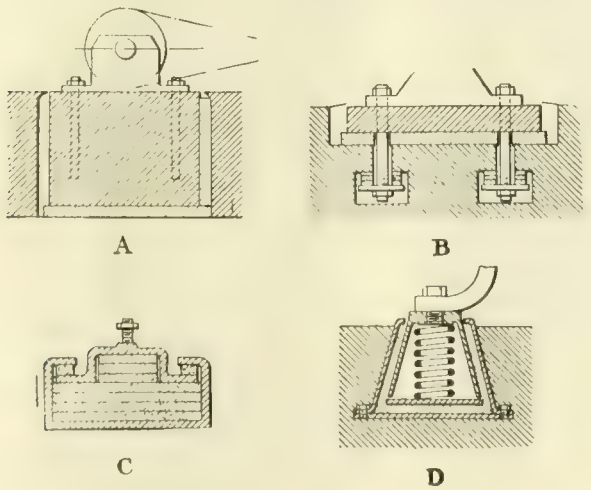


FIG. 1—SOME COMMON METHODS OF NEUTRALIZING VIBRATION.

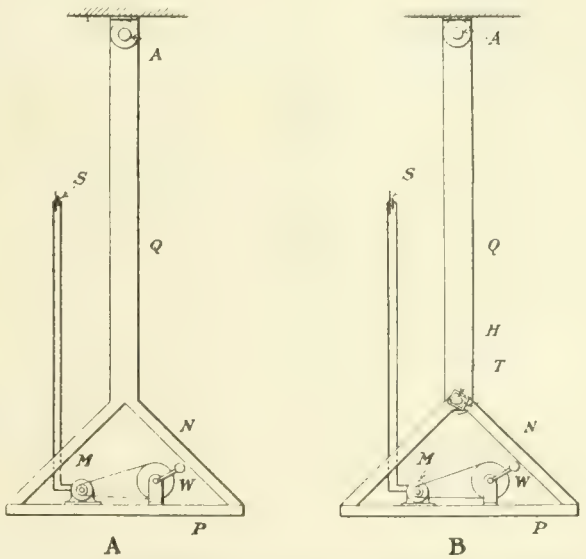


FIG. 3 A SYSTEM WITH ONE DEGREE OF FREEDOM. B—SYSTEM WITH TWO DEGREES OF FREEDOM, ONE OF WHICH MAY BE SUPPRESSED.

ture, turbine rotor, etc.); water in a steam turbine; peculiarities of the reciprocating mechanism,—for instance, a 4-cylinder or an 8-cylinder V-type engine where certain forces do not cancel out and where running balance alone is not conducive to perfect results; or torsional vibrations, which under certain conditions produce an effect very similar to that of unbalance. Our problem, then, is to analyze the effect of these various causes, with the view of designing a substructure for a given machine that will be least responsive to these causes, for this is what the "relative" freedom from vibrations really means.

But whatever may be the cause of vibrations, it is safe to say that in general they are always due to forces, acting in a plane or planes, perpendicular to a certain axis, also to centrifugal couples, located in a plane, rotating about a certain line, usually the axis mentioned just above. We know from elementary mechanics that any motion of a body can be resolved into six distinctly separate motions: three along the three mutually perpendicular axes drawn through any point, within or without the body, and three about these same axes. A free body, capable of displacement in any of these six modes, is said to possess six degrees of freedom.

Vibration as Affected by Degrees of Freedom

If the body is rigidly locked so that no displacement of any kind is possible, we say that all six degrees of freedom have been suppressed. By fixing two points in the body we have the effect of rotation about an axis, and only one degree of freedom, that is, the angular displacement about the axis, characterized by these two points. By fixing one point we suppress all bodily motion along any three axes through this point, but we still have three degrees of freedom, that is, freedom of angular displacement about any or all three axes. Fig. 2 shows a body whose point O is fixed. Such a body can have only three kinds of displacement: (1) about the axis y, as shown by the arrows a or b; (2) about the axis z, as shown by arrows c or d; and (3) about the axis x, as shown by arrows m or n. It makes absolutely no difference what the forces are which act on the body, no other motion is conceivable.

On the other hand, placing a body upon a thick sheet of yielding material, or for that matter on four springs, means freedom in all six directions; and of course the same applies to cushions or pads. For this reason it appears to be of extremely questionable value to interpose layers of such material between a massive sub-foundation and the foundation proper of a machine, even if isolated examples are on record where such an arrangement actually happened to give satisfactory results.

What Is Stability?

With the foregoing in mind, let us digress for a moment. Stability with regard to our subject is a somewhat relative term. Why was the Great Pyramid built upon leveled rock, even, we are told, dovetailed therein? To insure stability. Why is a ship's compass or barometer mounted in gimbals? To insure stability. Why build a massive foundation for an engine? To insure stability. Why provide a layer of yielding material or springs or rubber pads? To secure stability. In other words, it is quite necessary to design in a more rational way the purpose of a foundation for an engine of a given type. We shall attempt to do this, first stating, however, the well known effects of vibrations on various types of apparatus.

In large power plants where the main units are of the modern turbo-generating type the steam mains have been known to burst, and subsequent investigation has often revealed no defect in either material or in general arrangement of piping. The accident can thus only be explained as due to "rough" running, that is, vibrations. What, then, would be the remedy? To anchor the unit still firmer, or to place it on more yielding substance, thus encouraging the effect commonly known as "flopping around"?

The operation of a printing plant or of a leather-working factory is often extremely unpleasant for adjoining dwellings, and sometimes even for buildings located at a rather considerable distance. Inspection often reveals the machinery in such plants as firmly secured to extremely massive foundations and the owners are at loss as to how to remedy the trouble.

Within the building itself, irrespective of the effects on neighboring properties, the action of machinery is often felt and has been known to cause a great deal of annoyance and dissatisfaction. In addition to the printing press and the leather-surfacing machine, the types of machinery usually apt to cause trouble are as follows: triplex pumps, ice machines, air compressors (direct-driven), and various types of purely rotative machinery, such as blowers, centrifugal pumps, etc.

An internal-combustion engine often exhibits a certain amount of vibration which can be felt all over the understructure. In fact, owing to violent vibrations some of the tie rods, lamp brackets, etc., on automobiles have been known to snap in two, and in aircraft some of the instruments to drop off the board, yet these were parts of the understructure, to which they, as well as the engine itself, were firmly secured. The point we wish to emphasize is that in an understructure too much rigidity is as harmful as too much freedom to yield.

Stability Defined

We are now ready to formulate the new criterion of "stability" for foundations. Stability is here characterized by remoteness of the operative speed from any one of the several synchronous speeds at which the frequency of the operative speed would be nearly, or exactly, equal to the frequency of the free oscillation of the system, if displaced from natural state of rest and let go.

How many distinct synchronous speeds a system is capable of having depends upon the number of degrees of freedom. An absolutely free system, for instance, placed upon an elastic sub-foundation, may have six independent synchronous speeds, or "critical" speeds, as they are sometimes called. A massive foundation resting upon rock is likewise often apt to be, in the larger sense, free in all six degrees, since it occasionally does vibrate and propagates the vibration to other buildings, etc. A system with one fixed point may have only three such synchronous speeds, while a system mounted to rotate about an axis can have only one such speed or "period," such as it is often termed. If we could control these synchronous speeds, so as as to make sure that none comes anywhere near the actual speed of operation of the machine, we would then have a fairly complete solution of our problem.

Vibration in a Body With One Degree of Freedom

In order to understand clearly the foregoing as well as the broad methods here proposed, let us consider the following experiment and the general consequences manifestly derived therefrom. Imagine a pendulum (Fig. 3-A) consisting of a platform P rigidly connected to the member Q by means of the side members N. The system is free to swing about the axis A in the plane of the figure. A small motor M fastened on the platform P operates a countershaft carrying an off-center weight W. The motor is fed through a suitable flexible connection and it is always possible to adjust the speed of the countershaft carrying the weight W so that the number of revolutions per minute of the former will be equal to the number of double oscillations per minute of the pendular system, if the latter is slightly displaced from its vertical position of equilibrium and let go. The effect of this adjustment of speed will be the so-called "synchronism," and the extent of swing (amplitude) of the pendular system, in general very slight for arbitrary values of the rotative speed of the weight W, will now become violent, in fact, out of all proportion to the magnitude of the weight W itself.

This phenomenon of synchronism of cause and effect has been well studied. The amplitude at the exact condition of synchronism should theoretically be infinite, but of course in practice resistances of various kinds are always present, so that instead of infinite we have large amplitudes. The most curious fact is that in the vicinity of synchronous speed, both above and below, the amplitude drops down to a value almost

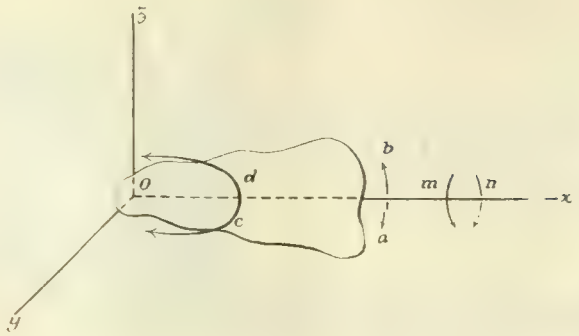


FIG. 2—DIAGRAM OF A BODY WITH ONE POINT FIXED.

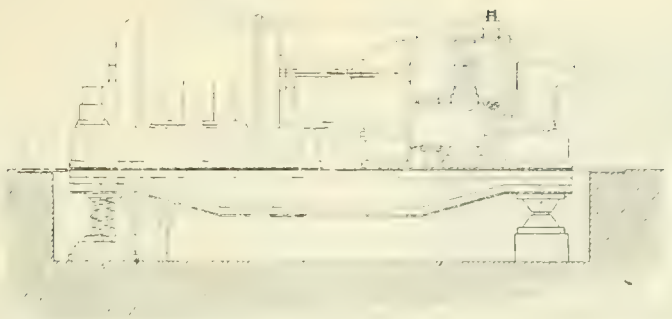


FIG. 4—APPLICATION OF AUTHOR'S DESIGN TO A TURBO-GENERATOR

insignificant, so that if the weight W is small the system appears to be practically at rest. Furthermore, any further increase of speed will not produce any effect, contrary to the current opinion of those not very well versed in the matter. For the sake of illustration let this synchronous speed be 100 r.p.m.

Vibration in a Body With Two Degrees of Freedom

As a modification of the experiment let us now provide another system (Fig. 3-B) identical with the first except that the platform P is not solid with the member Q but is pinned thereto at H, the pin used being both frictionless and at the same time so arranged that it can be tightened up by means of the nut T, so as to lock the joint, thereby securing the exact effect of the rigid pendular system of Fig. 3-A. Providing the pin H in the language of dynamics is the introduction of an additional degree of freedom, thus securing a system of two degrees of freedom; while the tightening of the nut T, amounts to suppressing one of the degrees of freedom, thus converting a two-degree into a one-degree system. In experimenting we shall first deal with the system of one degree of freedom, tightening the nut T and thus converting the pendulum into a system exactly similar to that discussed above, the synchronous speed being, say, 100 r.p.m. The pendulum will oscillate violently. We now loosen up the nut T, introducing an additional degree of freedom, with the apparently surprising result that the amplitude decreases practically to zero. If we reduce the speed considerably, say to 50 r.p.m., violent oscillations of the whole system will reappear, as will likewise be the case in speeding up the countershaft, say to 150 r.p.m. These figures are purely illustrative; whether they will actually correspond to exact facts will of course depend upon the characteristics of the system.

In other words, by introducing an additional degree of freedom we have accomplished this double result: (1) What was synchronous speed for a system with a single degree of freedom is no longer synchronous speed for the same system provided with an additional degree of freedom; (2) the new system has two frequencies of oscillation, at which it is sensitive to disturbing influences (such as centrifugal action of the weight W), one being below and the other above the value corresponding to that of the same system with the additional degree of freedom suppressed.

It should be especially observed that the oscillations were thus reduced practically to zero, not by steadying the system by something without it, but by some sort of an adjustment wholly within the vibrating system itself. Furthermore, what we did was to increase in a measure the flexibility of the system by breaking it in two; and although at first glance this might have increased the effects of the disturbing agency (rotation of off-center weight W) the actual effect was practically to bring the system to rest. It is still more important, however, to note the fact that we introduced the additional degree of freedom precisely in the sense of action of the disturbing agency, that is, in the sense of the plane of the figure and not at right angles thereto; or, say, in an up-and-down sense, as for instance by providing a coil spring instead of joint H.

The Basis of Foundation Design

This, then, will be taken as basis for our further discussion: In contemplating the design of a foundation we shall always separate those directions (or axes of instantaneous rotation) about which the system cannot (or at least is not likely to) oscillate from those directions (or instantaneous axes) about which the system is more or less certain to vibrate. We next shall select a "steady" point from purely practical considerations, and finally devise such means of controlling the "free periods" of the system as will secure the desired degree of remoteness from synchronism under the actual operative speed. Such means of course will be springs, exceedingly heavy, and not in the least calculated to allow of any free wabbling of the system. They will also be adjustable so that the desired periods may be readily varied within wide limits; and in general structurally arranged to introduce as few changes as possible in the arrangement as a whole.

The author feels that to submit too many particulars as regards the detailed designs of such an arrangement would certainly defeat the purpose of this paper, which is merely to introduce the broad idea and not any one of the scores of individual designs which might readily suggest themselves to the engineer confronted with the problem of designing a foundation for a given machine. Considering, therefore, only one type of apparatus, a turbo-generator (Fig. 4), we must start out with the selection of the steady point. We will naturally place it as near the steam main as possible (not to the exclusion, of course, of a suitable expansion joint), as under all conditions, should there be a choice of position, preference should be given to that point as far as possible from the center of gravity of the system, so that any static unbalance (whipping, etc.), would be made to act not as a force upon, but as a moment about that steady point. Such point should actually be made as steady as possible and no trouble should be spared in providing suitable piling or digging down to the solid ground and constructing suitable footings.

The next problem is to design a substructure adapted to receive the bedplate of the apparatus and made stiff enough so as to eliminate any "periods" of its own. This bedplate may be made of structural steel or of reinforced concrete, in which latter case the ends thereof may be made of cast iron. The substructure is supported upon the steady point either by a ball-and-socket arrangement, or is simply bolted at that point to the floor plate underneath by a bolt which need not necessarily be very light, but which must be arranged in a manner to secure the minimum area of actual contact. Remembering that in apparatus of this sort the tendency to oscillate about the axis x (Fig. 2) is always rather negligible, we have practically only two degrees of freedom and only two periods to adjust so as to have them well out of the limits of the operative speed. Hence the two sets of springs, one to take care of the period corresponding to oscillation in the vertical plane, the other to control motion in the horizontal plane. It should not be imagined, however, that these springs will necessarily be very light; they will always have considerable stiffness, but their function is that of being the only members that can yield and the whole situation is controlled by the proper choice of these yielding elements.

WHAT OUR READERS THINK AND DO

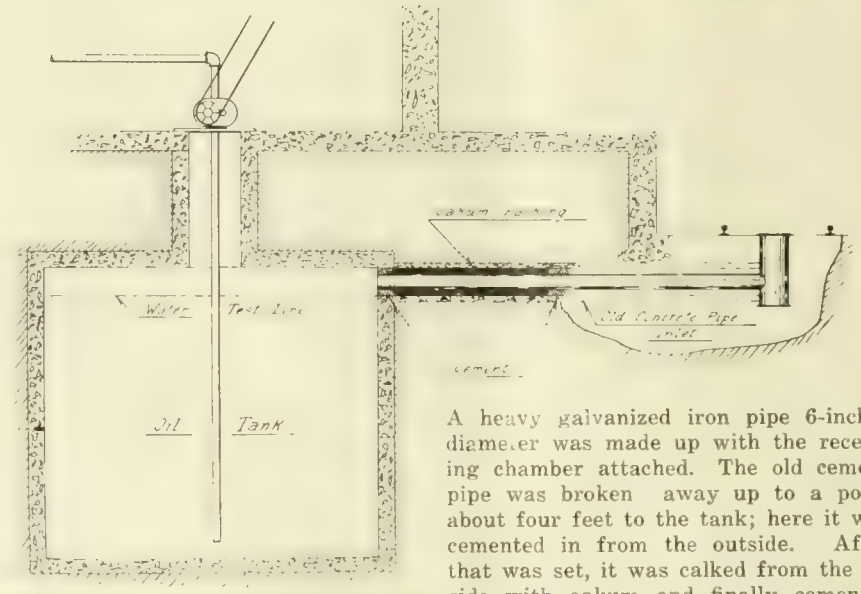
FUEL OIL STORAGE TANK

By John Homewood

The accompanying illustration depicts a fuel oil storage tank made entirely of concrete. This tank has a capacity of fifteen thousand gallons and is accessible only through a man hole in the top. A new building was erected over the tank, but either through damage caused in the construction of the new building, or through a slight earthquake, the tank was found to have developed a serious leak. As soon as the fuel oil was exhausted it was decided to have an examination made so as to ascertain the location and conditions of the break.

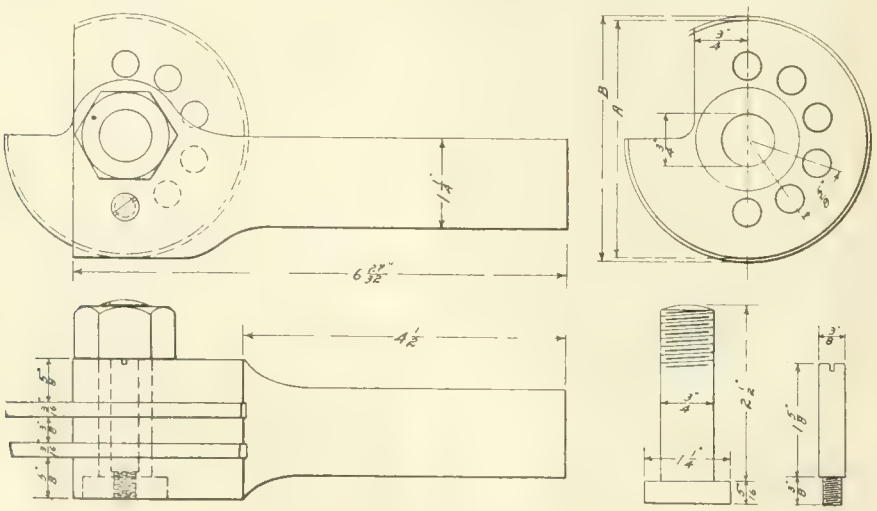
It is well known that there is great danger prevalent for a man to enter an empty tank that has held crude oil. A battery of three vacuum cleaners was connected to three pieces of 1½-inch pipe that reached the bottom of the pit where the heavy gases lay. These cleaners were in operation for four hours before a man ventured down.

The examination did not disclose anything in the form of a crack or break of any kind. As a leak showed up when the tank was filled, it was decided to give it a water test. The tank was filled to the top with water and measurement taken. In a few days another measurement was taken and the level showed to be in line with the intake. Several days more elapsed before another test was taken, which showed the same level. The intake to the tank was an eight inch cement pipe that led out to the centre of the track so that the tank car could empty into it direct. The excavation as shown was made, which disclosed that the pipe was in very poor condition at the joints and evidence to the fact that the leak was in the pipe. To attempt to repair the pipe was futile, so other means were resorted to.



SECTIONAL VIEW OF THE STORAGE TANK

There in the tank was fourteen thousand gallons of good water to remove without any means at hand except that we might try converting a pressure blower into a pump. This was attempted with great success and the water was soon removed. Now that we had the water out, and knew where the leak was, we could proceed with the repair. A heavy galvanized iron pipe 6-inches diameter was made up with the receiving chamber attached. The old cement pipe was broken away up to a point about four feet to the tank; here it was cemented in from the outside. After that was set, it was calked from the inside with oakum and finally cemented from the inside. The new pipe was encased in a concrete retaining box.



THIS VIEW SHOWS THE TOOL IN DETAIL.

DOUBLE PARTING TOOL

By Clyde D. Thorburn

Some time ago we illustrated a double parting tool for use in cutting piston rings from sleeve casting, and the illustration herewith is that of another double tool for the same purpose. This tool was designed so as to have a longer life and would always be standard width between cutters. It is ground only on top of cutting edge, its design allowing the necessary clearances required. Body of tool is made from mild steel forging shaped on all flat surfaces and two grooves sawn in head to receive the high speed circular cutters. The cutters are turned slightly concave to insure continuous clearance and bevel on cutting face to make a clean cut-off.

The top tool is turned ⅛ inch larger in diameter than bottom tool. This is to allow for sufficient strength of metal to hold on the lower ring when parting off upper ring. Six ⅜ holes are drilled through the cutters and hole to correspond through jaws being tapped through one side of jaw to take the retaining pin. This allows for the moving of cutters as they are ground back through wear. The tool can be used on the side head of a Bullard vertical or ordinary vertical boring mill. We are using it there and find it a distinct advantage over previous tools.

Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.

The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

The Prize Winner for December 23rd Issue List is J. A. RUSH, Weston Shops, Canadian Pacific Railroad, Winnipeg, Man. He Had All Answers Correct.

CONTEST FOR JAN. 20TH ISSUE

Contestants are required to write us, stating to which advertisements we refer in this number.

1—That more than a broken tooth can be removed—and as the dentist would say—without trouble.
2—Something that was redesigned and saved half the former cost.
3—A machine said to have considerable versatility.
4—Something that permits of various kinds of tooling.
5—A portion of a machine that is carefully heat treated.
6—A product that is quickly relocked.
7—That you must vary your cutting tool if you want the best results.
8—A product that is said to prove its quality quickly.
9—How to take the jump out of a belt.
10—Something that is made to stand rough usage.
11—Something that is said to be the understudy of necessity.
12—A product said to work without a slip.

These are Correct Answers for List from Dec. 23rd Issue:

1—Geo. F. Foss Machinery & Supply Co.
2—The L. S. Starrett Co.
3—E. C. Atkins Co.
4—Kearney & Trecker Co.
5—Bilton Machine Tool Co.
6—Hendey Machine Co.
7—J. Ackworthie, Ltd.
8—Canadian Link-Belt Co.
9—The Sidney Tool Co.
10—Canada Machinery Corporation Co., Ltd.
11—Nicholson File Co.
12—The Geometric Tool Co.

Closing Date for This Contest is February 10th

DEVELOPMENTS IN SHOP EQUIPMENT

SELECTIVE HEAD LATHES

The Lehmann Machine Co., St. Louis, have placed on the market a line of improved selective head lathes. This geared head gives a large numbr of speeds with very few gears. The tooth travel is moderate at all spindle speeds, thus ensuring quiet running.

There are only ten gears in the headstock which give sixteen spindle speeds, (on 16-inch lathe from 10.5 to 422 R. P. M. and on 22-inch lathe from 8.5 to 330 R. P. M.) These speeds are in almost exact geometrical progression and all obtained without the use of the countershaft. No safety or interlocking device is required to avoid engagement of differing gear ratios at the same time, as design makes it impossible for this to occur.

All gears in the headstock are of heat treated steel of a special selected grade for the purpose. Some of the gears and back gear clutch are carbonized and hardened. All shafts are high carbon steel and run on ball bearings. Shafts having sliding members are made with four keys milled integral with the shaft. All shifting members are operated by a ring which runs in a groove and completely encircles same.

The gear ratio on the 16-inch lathe is 57.1 to 1, and on the 22-inch lathe 70.6 to 1. The other sizes are in proportion.

The spindle, which is made of alloy steel, has hardened and ground bearings and runs in bronze boxes. Where the back gear clutch slides on same there are four keys milled integral with the spindle. There are two diameters on spindle nose both giving bearing for face plates or chuck plates, one bearing being in front and one bearing behind the threads on spindle nose. This makes a very rigid connection of chuck plates on spindle and very greatly facilitates the putting on and removal of same.

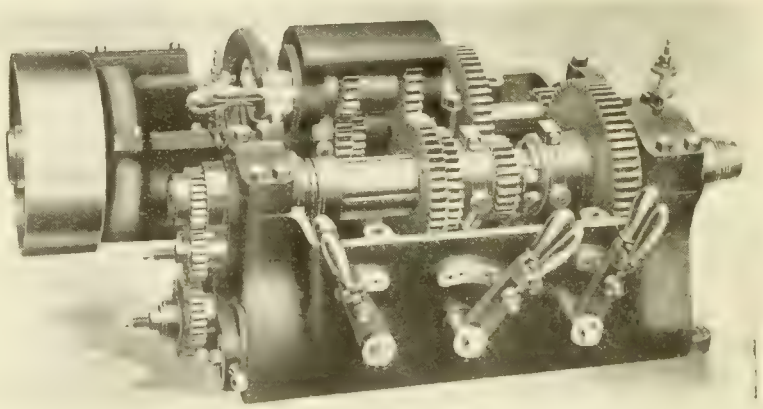


FIG. 2 HEADSTOCK OF LATHE WITH COVER REMOVED.

Friction Clutches

The friction clutches have forward and reverse, or brake, operated by handle on apron and a similar handle at headstock end of bed. This mechanism is operated through helical spur gears which run in oil and are mounted on shafts having ball bearings. These clutches require no adjustment and are said to always pull a little more than the load imposed. Cover on clutch housing forms an oil tight case and the clutches run in oil all the time. The film of oil covering cone surfaces has to be displaced when clutch is engaged which gives an easy pick-up and practically eliminates any wear. Male cone is made of hardened steel and female cone of cast iron which insures a very long life of these parts. Forward and reverse will engage and disengage very easily with slight movement of control handles and it will pick up whilst under full load without any trouble whatever.

Fig. 3 shows the construction of rocker The large diameter of its bearings in headstock, and the method for operating same without having openings in head-

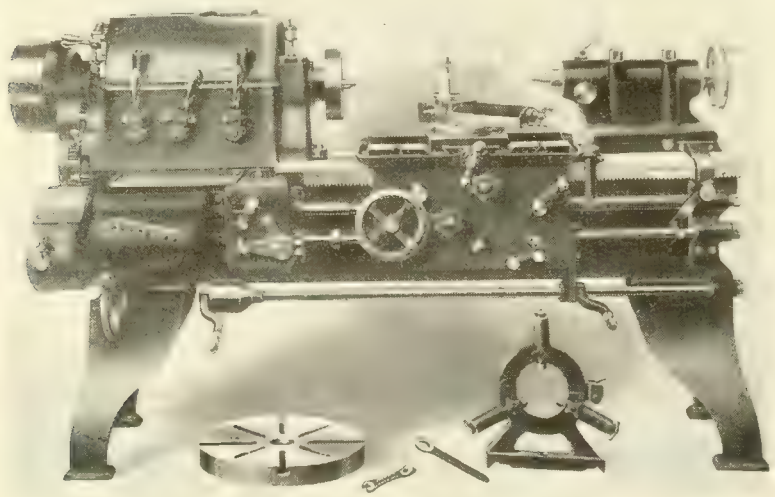


FIG. 1 GENERAL VIEW OF THE LATHE.

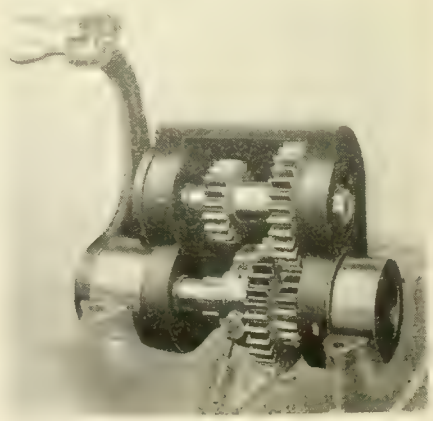


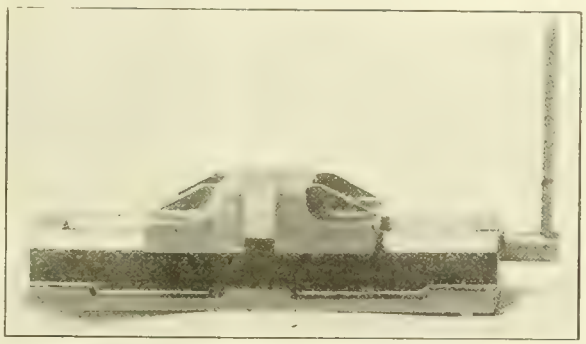
FIG. 3—SHOWING CONSTRUCTION OF ROCKER.

stock for the controlling handle can be noted. This view also illustrates the mechanism for shifting gears. The same substantial device is used for other shifting parts in headstock and eliminates possibility of trouble from this source.

The usual arrangement for direct drive is to mount motor on headstock with drive through belt and idler. This idler runs on ball bearings. With the fast belt travel on these geared head lathes this will be found a very satisfactory application and no trouble will be experienced on account of short belt, the pull on same being much less than is usual on account of the large diameter and high speed of driving pulley. This also permits the use of a high speed motor (1,800 R. P. M.) which makes same smaller, lighter and less expensive. Suitable guard for belt and pulley is provided. The direct drive can also be furnished with motor mounted on a base hinged to leg of lathe. Some users prefer this method of mounting the motor and on this no idler is required. Suitable guard for belt and pulley is provided.

NEW VISE

The Lang Manufacturing Co., Ltd., Guelph, Ont., have placed on the market



USING THE VISE IN A FLAT POSITION.

a new type of vise that is said to be especially adaptable for lathe, shaper, miller, drill press, and, in fact, all general uses.

The illustrations herewith show clearly the vise's general appearance. It will be noted that this vise is so constructed that it can be used flat, as at Fig. 1, or on its side, as shown at Fig. 2. This feature allows holes to be drilled at right angles without removing the work from the vise. This vise can also be used on the lathe face plate if so desired, and takes, as it were, the place of the chuck.

Attention is called to the fact that the slides of the vise are bevelled on both sides. This angle is designed so that all cuttings will fall off the slides and not stick and get ground into them.

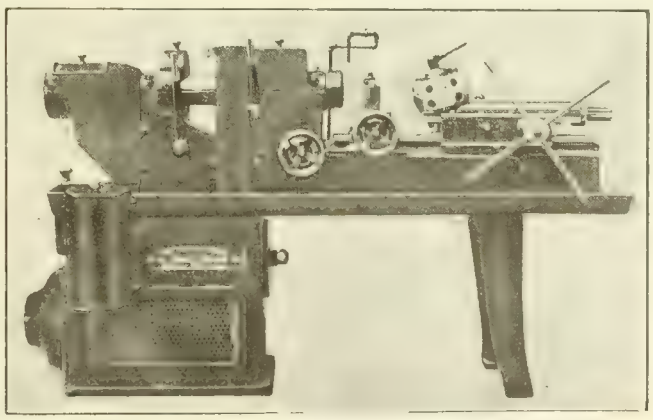
The concern who manufacture this vise have stated that they have thoroughly tested its efficiency before placing it on the market, having had one under actual working test for over a year. They claim that quick action with increased power is obtained, also that the jaws are always centrally located irrespective of the size of work held. There is said to be a live grip on both jaws, and no loss of power through the usual thrust collars.

It will be noted from Fig. 2, that there is a centre nut which braces and strengthens the power of the vise screw. This nut goes clear to the base. The vise handle is light of construction, yet is amply strong to exert the necessary gripping power.

ILLUSTRATING THE VISE AS USED WHEN ON ITS SIDE.

MOTOR DRIVE FOR TILTED TURRET LATHES

The improved motor drive illustrated has been adopted by the Wood Turret Machine Co. for use on their line of Tilted Turret lathes and screw machines. It will be noted that the motor base or cabinet leg is so arranged that the motor may be easily removed for cleaning or repairs, by the loosening of three screws that hold the circular lid at the end of the base. The power is transmitted from motor to the main driving pulley on machine spindle by means of a wide leather belt. This belt passes up through the oil pan and is protected from chips and cutting compound by guards which are welded to the pan. Belt tension is controlled by a double acting idler and is operated by the lever shown at the right hand end of cabinet leg. The controller box crank as well as all operating levers are so grouped that they are within easy reach of the operator, without necessitating a change of position. The principal advantage of this type of motor drive is the compact way of mounting and the adoption of an extra wide belt which can be controlled by the double acting idler mentioned above.



GENERAL VIEW SHOWING MOTOR DRIVE.

AIR LINE SEPARATOR

For the purpose of cleaning the air that is delivered to pneumatic tools, the Independent Pneumatic Tool Company of Chicago have developed a special separator for installation in pipe lines for the removal of dirt and moisture from compressed air. The air from the compressor is forced into the separator so that it strikes the walls of the casing tangentially, causing the air to revolve rapidly, thus throwing the dirt and moisture to the outside wall, whence it falls to the bottom of the chamber, the cleaned air passing on to the main pipe line. Provision is made for draining the dirt and water from the lower chamber. Two sizes are made, 150 and 400 cu. ft. per min.

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Says Conditions Are Better

WHEN Judge Gary, chairman of the U.S. Steel Corporation, states for publication that he can see nothing unfavorable on the business horizon, it carries weight.

"I think I am justified in saying," said Judge Gary a few days ago, "so far as my opinion extends, there is nothing unfavorable on the business horizon. Certainly at present the tendency is toward improved business conditions.

"That does not necessarily mean that there is a decided increase in volume, but it does mean that the general aspect, including the temper of business men, is better. If that continues, it is certain to have a decided improvement within a comparatively short time.

"As before stated, the principal reason for apparent dullness in some lines is that the purchasing public is waiting for such information as will influence it to conclude bottom prices have been reached. It should be evident to everyone that in certain lines or departments further decreases in selling prices are necessary and therefore likely to be reached. I have heard of cases where lower prices have been fixed by retailers than the prices they paid to the wholesalers for the same goods. It shows a disposition to make adjustments which have been determined upon for the purpose of complete readjustments, promptly disposing of stocks and of getting into a financial position which will enable the retailers to proceed in the regular way. And this is only an illustration of what must be done in all lines before we can expect good business.

"However, we all know by experience that after any movement of importance commences, as it progresses it gathers speed and will within a short time reach a momentum that means early completion of the movement.

"I see increasing signs of a disposition on the part of producers and wholesalers to recognize conditions and to submit to such reductions in selling prices as are necessary before a return to a normal volume of business.

"Also, it must be evident to everyone that a large percentage of workmen are disposed and are proposing reductions in wages immediately following the action of their employers to make reductions in their prices. This is a good sign and will have a decided effect. I hope and believe this disposition on the part of employees will be reciprocated by the employers.

"In the steel business to-day those who are buying are buying from the standpoint of necessity and this up to date has secured, for our corporation at least, a satisfactory volume of business considering the times and will, I hope, enable us to continue the payment of interest and the usual dividends. Under these circumstances how could we feel any other than optimistic?"

Improving Your Time

THERE is something highly encouraging in reports coming from some of the leading technical schools, especially in classes that deal with the practical and advanced practices of mechanics. There are a number of young men out of work now in nearly all the industrial centres. Many of these came into the mechanical field during the war work or shortly after. They had no previous mechanical training, and the munitions shop was a poor place in which to make a man anything like an all-round mechanic. It was the idea that he should learn to do one thing well, and once he had learned to do that one thing well he made good money. But the thing has changed now. There is very little for the handy man to do. Many of the shell-shop mechanics got a liking for this class of work and they are doing the only possible thing now when they have a chance, viz., get on the right path, and start at the start.

Mr. H. B. Beal, principal of the London Technical and Art School, reports that "we find that on account of the shortage of work an increasing number of young men, from 18 to 23 or 24 years of age, who have had some machine shop practice, are coming to the school in special day classes to receive machine shop work and draughting instruction. This movement seems to be steadily on the increase."

There are young men in all the industrial centres who are not hard up. They have no one depending on them and in many cases they have a little surplus.

Right now would be a good chance for them to do the very thing that a number are doing in the technical schools. They are studying. They are finding out the why and the wherefore of the things that used to be beyond them in machine shop practice before because they lacked the training. They are learning to read blue prints intelligently—they are learning in this way the fundamental principles of machine tool design. They might have been able to do a piece of work on a turret lathe before, but they did it as they were told—they can now find out the best way to tool for these operations. They can learn the value of jigs and fixtures to present-day quantity and production, the handling of materials by hoists and the general practice of good machine shop usage.

Investing a few months in this way will bring handsome returns in the future. If your purse will stand the strain, go in for it.

Sees Great Time Ahead in the Steel Trade

THOSE who are pessimistic regarding business should remember that as far as iron and steel are concerned the world's market is empty in many places.

Syren and Shipping, in an able presentation of Britain's case, says:

"Moderate supplies of both home and foreign iron ores, improved coal output; slightly better pig iron and steel production; downward price revisions; little buying until consumers are quite sure there can be no further concessions; hampered export business through exchange uncertainties; much talk of foreign competition but very little actual competition, owing to restricted outputs in rival countries—such are the surface features of the iron and steel situation.

Fundamental conditions are sound. Amid all the current difficulties and uncertainties, and in face of all the trade slump and foreign competition talk, it cannot, we think, be too often repeated, or too strongly insisted, that Britain stands, ultimately, to gain the most of what there is to be gained out of the unprecedented steel trade conditions created by the war and the war's immediate after effects.

With anything like a return to normal, this country will import more iron ore, and export very much more finished steel, than ever it did, or dreamed of doing, before the war.

Here Are Four Reasons

The four cardinal points are these:

(1) A world's shortage of steel goods, due to the damages and constructional delays since 1914.

(2) The paralysis of Germany, our greatest pre-war rival, through the loss of the Lorraine and the stoppage of her export subsidization scheme.

(3) The inability of France to exploit her newly-acquired resources through labor shortage and transport deficiencies.

(4) The inability of the United States to meet the world's needs in heavy products through abnormal home demands, excessive transport costs, and the dollar premium, this latter being due to the smallness of American imports.

America Must Buy More

America may produce the cheapest steel in the world, but she cannot permanently conduct a great export trade in steel, to far distant markets, unless she is prepared to take something like corresponding imports of the products of other countries. Averaged over the 16 leading foreign countries to-day, the American dollar, on the exchange, stands at $1 88. This 88 per cent. premium is a huge tax on American exports.

Out of these four cardinal points arises the fact that Great Britain, with her most convenient raw material supplies, her mines and furnaces side by side, her works close by her docks, and her unique shipping facilities, can beat the world in exportation of heavy steel and engineering products. Our greatest drawback is costly coal. But America is the only rival getting cheaper coal, and this advantage on the side of the United States is offset by long haulage distances for heavy mineral traffic.

The American coal, iron and steel group of trades have an average inland haul of 500 miles against the British average of less than 30 miles.

This is no time for panic or pessimism over British trade prospects. It is a time for hope, confidence and a determination to improve our production so that we can obtain that share of international trade to which our resources entitle us.

Time to Go Ahead

Let us convince our workmen of the need for bigger output and then many of our commercial troubles will vanish. In the steel trade, at all events, we have a world to conquer.

The single State of Brazil, on official authority, wants 16,000,000 tons of railway steel alone.

The wants of the Argentine and Chile are little less.

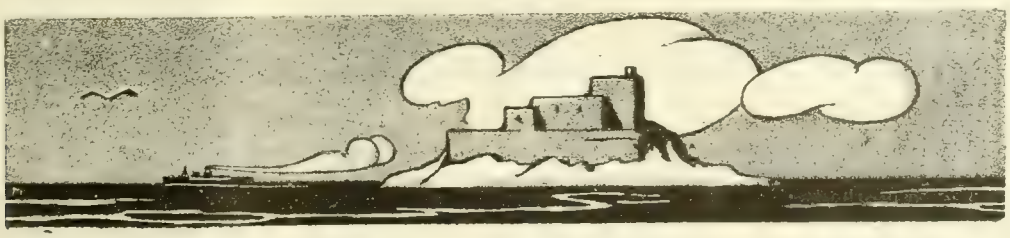
China has hardly been tapped yet as a steel market.

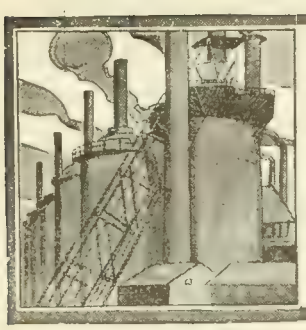
British India wants new railway extensions and equipments exceeding the mileage and furnishings of the United Kingdom railways combined.

The world's steel shortage, due to the war, the war damages and the war delays, whilst so many steel plants were on munitions, is **equal to three full years' production of every steel plant in the world, working at full capacity.**

And this great shortage is additional to the normal wants of the world, amounting to 80,000,000 tons a year before the war and additional to the fresh wants due to the demand for implements and machines to take the place of hand labor, now so costly. Against this huge demand, which will not be relaxed for many years, what are the competitive conditions? They are as already stated.

Germany is not producing at more than half her pre-war rate. The same remark applies to France and Belgium. The entire Continent of Europe is producing no more steel than Germany alone produced before the war. The United States has such an enormous home demand, and has to battle with such long transport distances, and is so prejudiced by the exchange, that she cannot retain, much less improve upon, the trade she secured during the war."





MARKET DEVELOPMENTS

Better Feeling Noticed In The Markets

Business is Still Placed Sparingly, but Many Firms are Now at The Point Where They Will Have to Take on Supplies Very Shortly—Prices Remain Firm in Steel.

IF indications, opinions and summaries are any indication of trade, then there should be an improvement in the near future. Any one who is spending much time calling on the trade can hardly help but notice a more hopeful feeling. Not that any larger orders are being put through, but there is as much trade as there was a month ago. Things are not getting worse in the iron, steel and machine tool business. Occasionally the dealer is met who says plainly that he is doing more business than he was a month ago. Orders for the most part are small, but they are coming in.

Stocks in warehouses and in manufacturing establishments are light. There are only a few exceptions to this and some places still appeal to their dealers to relieve their account by taking back some of this over-stock. This is not being done for the very good reason that the average warehouse is pretty well engaged right now getting rid of all the stock it can in order to take advantage of any better buying opportunities that may open up.

Steel prices hold firm and there seems to be little chance of any break, in fact many of those in the trade go so far as to say that any decided buying movement starting in now would cause a stiffening of prices above present values.

Pig iron is now quoted at $43.64 per ton, being a drop of about $8 per ton from the last figure named. Even at the lower price buying is light in most cases and users will take on just what they have use for in the very immediate future. There has been hardly a start made yet in the old practice of placing order for a year's supply.

The scrap metal market is very weak yet, but some of the dealers can see where they are going to make a start very soon in getting back to more active business. Canadian prices for nearly every grade are higher than those offered at United States points.

MONTREAL IS LOOKING FOR A BETTER TRADE IN NEAR FUTURE

Special to CANADIAN MACHINERY.

MONTREAL, Que., Jan. 20. — Trade conditions in this district are unchanged although industrial activities in some of the large metal plants have been resumed after a short period of suspension. Little departure from the conservative buying policy of purchasing agents has been noted and, in consequence, trade has not increased. Some little inconvenience has been experienced in the non-delivery of material that has been expected from the Sydney steel mills, but it is hoped that this condition will be rectified very shortly, when the embargo on shipments has been removed. Machine tool business is slow in picking up, slight increase being reported in supply movement. Old materials are still inactive.

Buying Restricted But Prospects Brighter

While there is every reason to suppose that the situation in general is less tense than formerly, there is still the attitude of conservatism on the part of the consumer in the purchasing of material and equipment. Buying, of course, is still going on, but in such a way as to emphasize the fact that nothing but what is required for immediate needs is being disposed of by the dealers. The latter, in turn, adopts the same policy, so that the mills are receiving comparatively few orders for future delivery. Some of the producers are kept busy in getting out unfilled orders, and the volume in this respect is becoming appreciably less, a condition which in time will influence the market to such an extent that further inducement, in the nature of lower prices, may be offered to the trade. The stock-taking period of many dealers is now over and some find that they still have considerable quantities of material on hand that were purchased on a rising market and which keeps them from adding further to their stocks even though they were assured that prices were at the low level—a condition that few are willing to accept. Few dealers will deny the possibility of lower quotations, but in face of the continued high cost of production, they cannot see just how a speedy return to "near normal" can be brought about without serious loss to manufacturers and disorganization in many lines of activity.

"We look for a gradual return to more active business but feel that consumers will remain out of the market until the last minute, in the hope that better prices will obtain. Industrial activity will undoubtedly be accelerated from now on, but until labor conditions are definitely adjusted it is next to impossible to expect a resumption of normal operations when everyone is looking for lower prices on all commodities."

Dealers state that business is not brisk but is of a character to encourage renewed interest, as it is thought that much buying is held off only in the hope of easier prices. Should anything develop to give the assurance of a stronger market, buying would naturally follow. Prices here have continued steady but with a weakening tendency. Predictions tend to show that price quotations may be slightly reduced before long.

Gradual Betterment Expected

Despite the renewal of operations in many plants, closed for holidays or stock-taking, the call for machine tools has not shown any increase to speak of over past weeks. Some little improvement has developed in the sale of supplies and small equipment, but the volume of business is still below normal. However, we are too likely to accept the term "normal" as meaning the condition prevailing throughout the past several years. As

stated by one dealer in machine tools: "We cannot deny that trade just now is considerably below what it has been during corresponding periods of the past few years, but if the situation is compared with pre-war times, we will undoubtedly find that we have nothing to complain of. We have been so accustomed to heavy turnover that an interval of quiet trading appears like excessive dullness. True, the present is quieter than usual, but it is only the reaction of industrial extravagance. What we need is faith in the future and a realization that the trade is ready to take advantage of the opportunity when the occasion arises." Asked as to the outlook for the year, the dealer stated that it would be exceedingly good and that after a short period of featureless activity, the return would be more marked.

No Developments in Scrap

"Reports from the outside claim that business is slowly improving but, as far as we are concerned, there has been nothing to show that the old material dealers are sharing in this improvement. We are still on the waiting list." This statement by a scrap merchant goes to show the listless condition still existing in this market, and although they look forward to renewed movement early in the spring, the immediate future does not promise anything but the quietness of the past few months. Quotations are inclined to weaken, but under present conditions prices are not an influencing factor.

WORKING HARD FOR BUSINESS

And Some of the Firms Are Getting Results—May See Change for Better in Scrap Market

TORONTO.—Firms are going after business with renewed activity now. In some cases they are getting results. There are cases where the selling arrangements were changed at the first of the year. Salesmen were put on a salary with a chance to make much more on commission if they turned in the business. Salesmen have their own way of looking at these things, and one old timer put it this way: "I have a new contract for this year with a smaller salary but a chance to make it up or more on commission. The only grounds on which I took the contract was that it would be good for a year and a half, and before the end of that time I should be able to cash in on it even if things are none too good at the start."

In small tools as well, agents are working harder than ever before to get business.

There has been a certain amount of business placed by the railroads, but they have not taken on anything like the amount of equipment they are supposed to be contemplating. Complaint still comes from some of the dealers that they are not very particular about some of the railroad business because of the time that elapses between the filling of the order and the forwarding of the money.

Some of the larger machine tool and supply houses, with agencies at several points throughout the Dominion, are more optimistic in their outlook now, as reports from many of the outlying offices indicate that there is a better tone in many districts. Some of the cities where the manufacturing is of a diversified nature, and where little depends on the automobile business, are having good business. The auto industry has not yet reopened to any great extent, although some of the shops have made a start in a small way, but just now will not commit themselves as to the extent to which they hope to increase the force.

Reports Improvement

Sales of small tools are improving, but the improvement is coming as the result of two things, viz., hard work and the fact that users of small tools have nothing in stock. One of the dealers told Machinery this week, "We have done more business in small tools this week than we did last month. There were no very large orders, but a lot of small ones. There must be some good buying done as soon as things start to get busy again because none of the shops have anything much on hand. Usually they have stock that will take care of their operations and it is to the interest to keep a good line ahead, especially on sizes that are much used. We look to see a good deal of business inside the next few months."

The Steel Market

Apart from boiler tubes there is no brisk buying in the steel trade this week. There is always the usual orders to be attended to, but there is nothing apart from this. Some of the manufacturers continue to appeal to the warehouses to relieve their account by taking back certain material they have in stock, and for which they have no immediate use. In many cases this has been placed in stock at a figure above the present market price, and dealers are not inclined to take anything back in the present market.

Some of the independent mills have men over in Canada now looking for business, with a view of getting enough tonnage on their books to start operations. One rather noticeable thing is that a salesman from one of the smaller tube mills was in this district calling on the trade. "Why for the last five years that chap has gone around hardly on speaking terms with us," stated one of the steel trade men to-day, "but now he is quite willing to drop around and talk business with us looking to securing an order."

Most of the steel warehouses do not look for much business for the next few weeks. "As far as we can see the first quarter of the year will be a dull one," was the comment of one dealer. "After that, from what we can gather, there should be much better going."

Pig iron is down from the last quotation, foundry iron being quoted now at $43.64. Buying is not very free now, and users are taking on just such amounts as they consider necessary to get along with.

May Improve Shortly

The scrap metal market shows nothing on the surface that would lead one to see any improvement, but dealers believe that things are going to get better before long, and the average scrap metal man is not a confirmed optimist. One of the dealers has just returned from a trip through quite a section of United

POINTS IN WEEK'S MARKETING NOTES

The new price announced for pig iron in this district is $43.64 per ton for No. 1 foundry iron. Buying for iron is not particularly active at the present time, most firms taking on only what they need for immediate use.

—

A representative of the largest scrap metal concern in the country has just made a trip to a district in the United States where considerable scrap from this country is disposed of. He believes that there is going to be an improvement in the scrap metal situation very shortly.

—

One dealer in small tools reports that business is much better. In fact he claims that he has done more business in the last week than in a month previously.

Some manufacturers continue to appeal to warehouses to take back some of the material they have in stock. This is not being done as warehouses generally are trying to reduce their stocks so that they may take advantage of any better buying opportunities that may develop.

—

Reports from the New York machine tool market say that there is more inquiries although most of these are for single machines. Makers have so far adhered to their old selling prices.

—

Pittsburgh reports that there is more price cutting going on at times, but for the most part each cut represents a single sale and cannot be taken as meaning that the practice of price cutting has become general.

—

Stell mills in Chicago district announce reduction in wages of 20 per cent. at two of the largest establishments.

States where a great deal of scrap metal is usually disposed of. He believes conditions there are going to improve quickly, and there should be a chance, if there is no improvement here, to send Canadian metals across the line. At present Canada is paying more for nearly every grade of scrap material than United States. Yards are still operating on a very low basis.

NEW YORK LOOKS FOR IMPROVEMENT

Conditions in General Favor Renewed Trade—No Change Made in the Selling Prices

NEW YORK, Jan. 20.—While there is no noticeable improvement in machine-tool business, sentiment is somewhat more cheerful as a result of the apparent turning of the tide in the business depression.

Since the first of the year the developments in certain industries, notably textiles, have been of an encouraging nature, and a better tone has been reflected in the security markets, all of which has its effect on sentiment.

Inquiries are slightly greater in number, although mostly for single machines. There is nothing tangible upon which the machine-tool trade can base expectation of a revival in tool buying, but some expect a very gradual improvement from now on. Many manufacturers are still engaged in taking inventories and when these are completed they may give their attention to machine-tool requirements for this year. The demand for used tools, particularly large types, is better.

While there have been a few price reductions by machine-tool manufacturers, the majority have taken no action and probably will not do so for the present. The attitude of the trade is that reductions would not stimulate buying and are not justified, according to present costs of production.

PRICE REDUCTIONS HAVE BEEN MADE BY MANY INDEPENDENTS

Special to CANADIAN MACHINERY.

PITTSBURGH, January 20.—The iron and steel trade very generally approves Judge Gary's statement made to the newspapers last week. The statement, as is always the case with Judge Gary's utterances, is temperate and at the same time it is hopeful. It is interesting to note that in less than three months Judge Gary will round out 20 years of active service as chairman of the United States Steel Corporation. He does not claim that the steel business has improved of late, but he insists that general sentiment is better and more hopeful. Prices of some commodities must come down farther, he says, the public being in a waiting mood and being ready to take hold when it is convinced that prices are right. Judge Gary does not say that steel prices will not decline from the present level, and probably believes that eventually they will, particularly as costs are going to decrease.

Production

There has been no material change in the rate of steel production since the first of the year, the rate being slightly over 90 per cent. for the Steel Corporation and about 25 per cent. for the independents, representing in ingots about 21,000,000 tons a year for the corporation and 7,000,000 tons for the independents, or 28,000,000 tons altogether. This is two-thirds the rate at which steel was made during the first nine months of last year, but it is only about 53 per cent. of the capacity. On account of various difficulties, chiefly the insufficiency of rail transportation facilities, steel production during the first nine months of last year averaged only 80 per cent. of capacity.

It will be noted that according to the above estimates the Steel Corporation is producing about three times as much steel as the independents, whereas it does not have more than 44 per cent. of the capacity. The condition is, of course, the aftermath of the divergent price policies pursued in 1920 by the Steel Corporation and independents respectively, the corporation holding its prices down to the Industrial Board schedule of March 21, 1919, while the independents advanced their prices by various amounts, some to the highest figure that could be obtained from anxious buyers for prompt shipment, others to various intermediate levels. Naturally at the windup the Steel Corporation found itself with a well filled order book, while the independents had relatively little on order books, and some of that business was cancelled or suspended, even though eventually the independents marked down the prices in their contracts to the Steel Corporation level.

All this has been well understood, but what is developing now is of particular interest. It might have been thought that when the independents got down to the corporation price level a good bit of the Steel Corporation business would be cancelled, and the independents, by making slight cuts in prices, would be able to get some of that business. The outcome, however, is proving quite the reverse. The corporation has had some cancellations, but it is not of business that is being transferred to independents. On the other hand, some buyers who have not heretofore been customers of the Steel Corporation at all have been making an effort to get on the Steel Corporation's books, feeling that that will be a safe place, in view of the probability that steel will at some future time become scarce again, whereupon the experiences of 1920 may be repeated, though of course in milder form.

Prices Remain Steady

There is scarcely any actually new business developing, and as a result the independents have no business offered them of sufficient importance to justify their doing much price cutting. Prices are only cut, of course, when there is an incentive. Thus the finished steel market may be described as steady, being at the same time very far from active.

No doubt in some lines there is occasional price cutting, say by from $1 to $3 a ton, but each instance represents a separate case. A cut price sale does not reduce the market to the lower level. In a regularly declining market that is what occurs. A few sales are made at a certain cut, then to effect additional sales the mills have to make fresh cuts, and so on. There is no such process now. Eventually, no doubt, this will come, but there are two pre-requisites, a larger volume of new business offered, making price cutting worth while, and a reduction in costs.

Wages and Costs

The latest reports are that the Inland Steel Company and the Steel & Tube Company of America, both in the Chicago district, have cut wages 20 per cent., effective January 16. Previously, reductions had been announced by the Wheeling Steel Corporation, Bethlehem Steel Company, Midvale Steel & Ordnance Company and some minor steel interests. There have been no wage reductions of consequence in the immediate Pittsburgh district or in the Youngstown district. On the whole less than half the independent steel capacity has reduced wages, while the Steel Corporation does not seem to have considered the matter and it is not expected to make any reduction for a long time.

The independents that have not reduced wages are keeping their counsel, but it is a fair assumption that their attitude is about as follows: A wage reduction at this time would do little good in reducing costs, when mills are operating so lightly. It would encourage buyers to look for lower prices, or even demand lower prices. The men would not accept wage reductions as willingly as after a period of idleness, such as they have lately begun to experience, while at the same time the continued decline in the cost of living will help to make wage reductions acceptable.

Another consideration of importance is this, that there are various methods of getting down costs, apart from the making of a horizontal wage reduction, that should naturally be practised first. Less efficient men can be let go and the more efficient retained. Bonus rates can be discontinued, men being let go and re-

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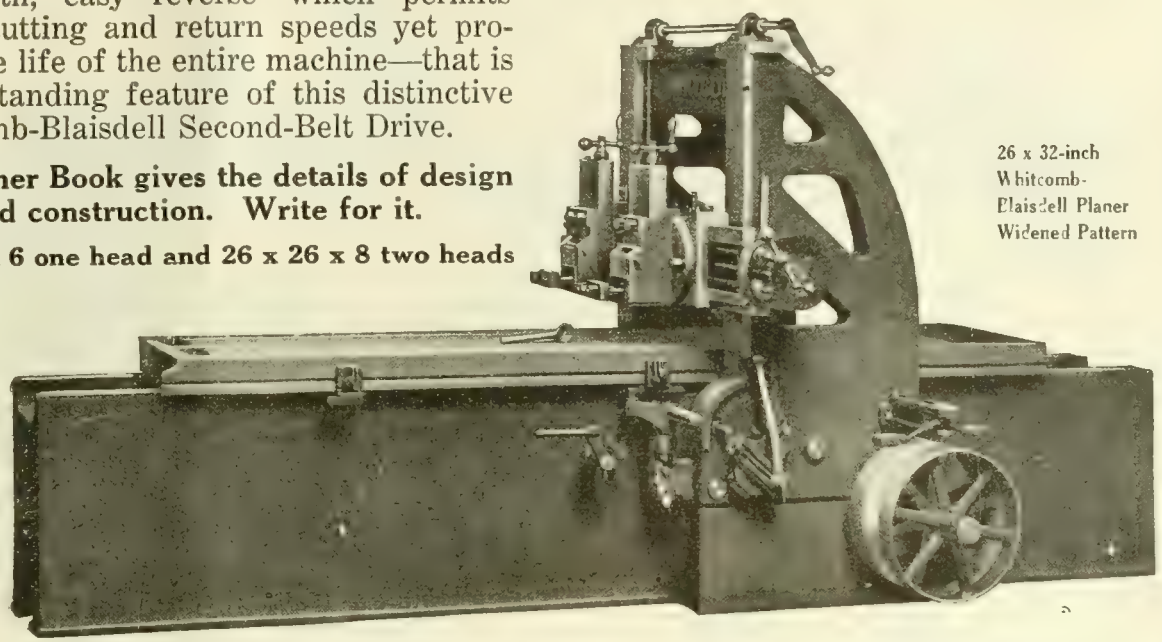

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Pig Iron

The $33, valley, price on foundry iron has yielded, as it was to be expected it would when actual buying developed, particularly since basic had been voluntarily marked down by furnaces to $30. Several furnaces have sold in lots averaging about 500 tons each at $31.50, valley. They had quoted $33 but buyers would not take hold, and the $31.50 sales were probably made by furnaces accepting a bid at that figure. Nothing has occurred in Bessemer or basic. The market is now quotable at $32 for Bessemer and malleable, $30 for basic and $31.50 for foundry, valley basis.

CANADIAN WAR MECHANICS ASK CONSIDERATION FOR THEIR CLAIMS

Many Canadian mechanics who went to Britain to work in war shops have appealed to Premier Meighen for relief from the discrimination they have encountered and for the loss they sustained while working in the British shops.

Some of the experiences are set forth as follows:—

When the urgent call for experienced munitions workers came to Canada from Great Britain, the statement sets forth, members of the association responded. A large percentage were married men who entered into the proposal from high patriotic motives, and, forgetful of the financial aspect of the matter, failed to make proper provision for their dependents left behind. These dependents, it is stated, received no benefits under the Patriotic Fund, and, in a number of cases, mechanics returned home after four years' service to find their families destitute.

Believing it would be economy, many of the married mechanics took their families to England with them, at their own expense.

Shortly after arriving, it was learned that British munition workers in shops ten miles or more away from home, received $4.20 a week subsistence allowance. Canadian mechanics, working under British government contract, applied for the allowance, finding wages paid them were insufficient to meet the cost of living.

After some negotiation, the allowance was granted, but only to such men whose families were still in Canada. No subsistence was allowed men with families in England.

Allege Unfair Pay

The Canadian mechanics were paid on the basis of pre-war rates for skilled British workers. They received increases as granted to the British workers, but these did not come until 1918, and for at least three years, $10 a week, it was asserted by the delegates, was a common wage for a married man. When the "Dilutee" system was inaugurated, British factories and shipyards were throng-

ed with unskilled women and young men who were allowed to work on the piece work system. The Canadian mechanics were given the task of training these dilutees, and it fell out, in a short time, that many of these new workers were making as high as $15 a day shift. Efforts by the Canadian mechanics to obtain piece work privileges proved fruitless, and it soon became common that the worst student worker in a shop was getting as much or more per day as the skilled mechanic teacher was getting a week.

After the armistice, the statement continues, British munition workers were given benefit under the unemployment insurance plan—to which Canadian mechanics also had paid weekly. The benefit amounted to $6.96 a week for 26 weeks. Canadians were shipped home and given a total amount of $23.75 "resettlement money" to take care of the period of unemployment in Canada.

The statement concludes with a summary of claims, to which Mr. Meighen promised to give close attention at an early meeting of the cabinet.

Here is a synopsis of the claims:—

That the Canadian government give the mechanics status as returned soldiers and eliminate discrimination against them.

That subsistence equal to that paid British munitions workers be paid for the entire period during which it was withheld.

That the same unemployment benefit given British mechanics be accorded Canadians who paid into the insurance fund.

That 50 cents a day for every day of service be awarded each overseas mechanic resident in Canada, toward re-establishment.

That overseas mechanics be brought under the Soldier Settlement scheme.

That repatriation expenses be allowed such as were compelled to return to Canada, before the armistice was signed, through ill-health.

STEEL OF CANADA SALES FORCE HOLD SESSION IN MONTREAL

THE ninth annual sales conference of the Steel Co. of Canada was held at Montreal on January 13, 14 and 15, the sessions taking place at the Windsor Hotel. The gathering was representative of the entire organization, and a number of the executives and factory heads were also there, including the works manager and superintendents from the plants at Montreal, Brantford, Hamilton, Toronto and Belleville.

The Thursday morning gathering was largely of the get-together order, when the incoming visitors were welcomed by the committee in charge. Mr. Robert Hobson, president of the Steel Co. of Canada, presided at this gathering, assisted by Mr. R. H. McMaster, vice-president, both of them dealing with several matters of interest to the company. The secretary-treasurer, Mr. H. H. Champ, went extensively into figures dealing with the sales of the organization, and also with the exchange rate during the year 1920, pointing out that the average against Canadian money during that period had been 13 per cent. One point was brought out that was of special interest, and which by the way reflected no small credit on the collection department and the sales force, viz., that the losses through non-payments of accounts had amounted to only a small fraction of one per cent.

Mr. Lloyd Harris, a director of the company, was also one of the speakers at this session, having only a day or so before attended a meeting of the automobile manufacturers in Detroit, where the whole position had been thoroughly discussed. Mr. Harris made it clear that there was need for more aggressive selling now than for some time past. For a long time everything had been in favor of the seller, the real salesmanship had been allowed to lapse in many cases. The market was in favor of the buyer now, and salesmen ought to adjust themselves to these changed conditions. The meeting in Detroit had felt that things were definitely on the mend now, although the start might have to be made in a small way, but a better buying movement was looked for, and it should take on definite form early in April, and perhaps in some measure before.

The sales conferences themselves were presided over by Mr. H. T. Diplock, eastern sales manager, Montreal, and Mr. George Spence, western sales manager, Hamilton, able assistance being given by Mr. D. J. Black, assistant sales manager at Montreal, and Mr. Charles E. Harrison, assistant sales manager at Hamilton. Reports given by a number of the men from various parts of the Dominion dealt with many phases of trade and problems of salesmanship. The consensus of opinion was that trade was going to be better early in the year. Stocks in nearly every centre are low, and manufacturing concerns are not putting in their accustomed supplies of raw material, so when business does start to move there will be purchasing done on a fairly good basis.

Some of those who are accustomed to be present at the sales conferences, but who were not able to be there this year, through various causes, were Charles S. Wilcox, chairman of the Board of Directors, Cyrus A. Birge, one of the directors, George A. Simpson, special representative, Hamilton, Thomas Moore, assistant sales manager, Hamilton, and D. B. McCoy, of Vancouver.

The annual banquet at the Canada Club proved to be a thoroughly enjoyable affair, and the entire company stands ready to vote Mr. Hobson the one and only chairman for such an occasion. The toast to "our officers" was proposed by J Orr Callaghan, works manager of the Canada Works, Hamilton, the response being given by Mr. Robert Hobson, president, Mr. R. H. McMaster, and Mr. H. H. Champ. "Our works," was responded to by Mr. Jaquays, works managed at Montreal, and Mr. R. G. Wells, works manager at Hamilton, also superintendents McEwen and John L. Smith of Hamilton, and Flaherty and Johnson of Montreal. "The Sales Organization" drew responses from Messrs. Spence and Diplock, sales managers of west and east respectively, Fred Perego and Stuart Kell. One of the most impressive incidents of the gathering was the response by Mr. Fesserton, of Montreal, to the toast of the "Visitors." Mr. Fesserton, who has retired from active life, was for fifty years connected with the Steel Co. of Canada and its predecessor, the Montreal Rolling Mills, which was taken in at the time of the amalgamation. Mr. Hobson issued a special invitation to him to be present at the banquet in Hamton next year to the sales force.

The committee in charge of the conference and banquet earned the thanks of the whole organization. They attended to every detail and left nothing undone that would make the affair a success. They were Messrs. H. T. Diplock, J. D. Black, A. Y. Paxton, S. N. Colcomb and E. M. Russell. About 150 attended the conference.

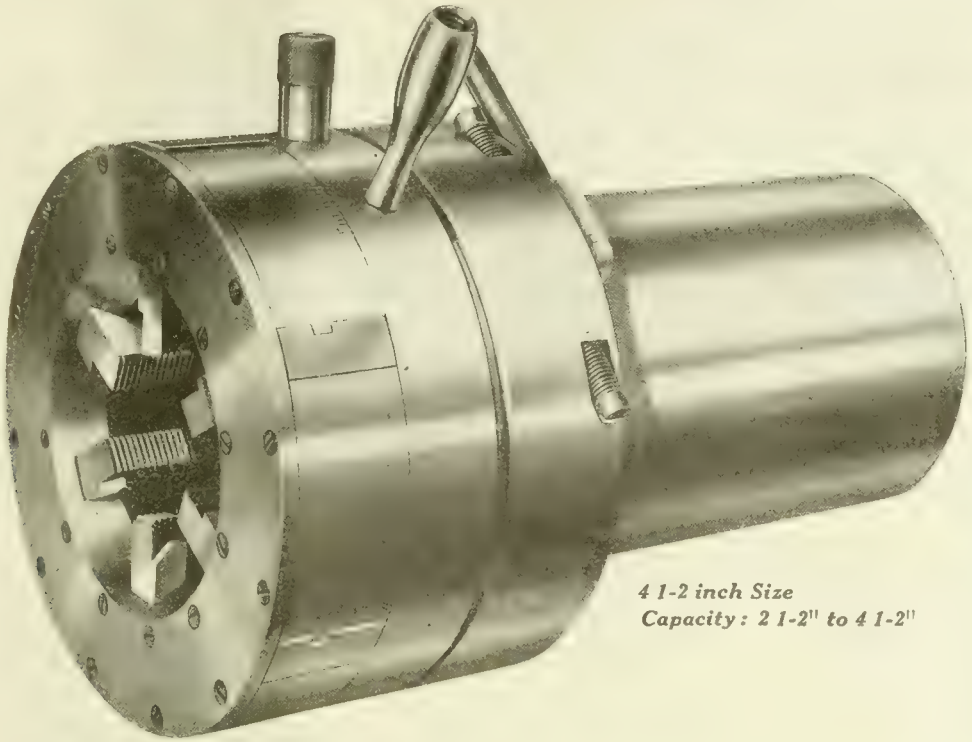
The Steel Poet Sings

The Steel Co. of Canada harbors in its Montreal branch a bit of a poet, in the person of H. E. Skeats. On top of the menu card used at the banquet of the sales organization were several verses from Mr. Skeat's quill.

Looking back over the restricted diets of war years the Montrealer lifts his voice and chants thusly:—

Good evening, gentlemen—take your seats,
And run your eye o'er this list of eats,
Food censors have vanished in ambient air,
So hew your way through the bill of fare,
Nor trouble yourselves with the awful thought
That you're putting away what you didn't ought!

I suppose you remember the days gone by
When on bacon, and butter, and beef you were shy,
When you dare not consume a succulent steak!
For fear that a Food Commandment you'd break
When the grub you ate, as it sank to rest,
Seemed to your sensitive souls to protest
That you had no right to devour, by gee,
The food that should nourish a refugee!



4 1-2 inch Size
Capacity: 2 1-2" to 4 1-2"

5-16 inch size
Capacity:
3-32" to 5-16"

The Screw Machine Man Says:

"Everybody recommends Geometric Die Heads. Better Threads in Quicker Time is the reason."

It doesn't matter how strenuous the job is, a Geometric is built to handle it easily.

Make Screw Thread-Cutting the Most Satisfactory Operation in Your Shop

——Write——

THE GEOMETRIC TOOL COMPANY
NEW HAVEN CONNECTICUT

Canadian Agents:

Williams & Wilson, Ltd., Montreal.
The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B., Halifax, N.S.
Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

If interested tear out this page and place with letters to be answered.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$33 96
Lake Superior, charcoal, Chicago	48 50
Standard low phos., Philadelphia	44 79
Bessemer, Pittsburgh	33 96
Basic, Valley furnace	30 00
Toronto price:—	
Silicon, 2.25% to 2.75%	43.64

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 75
Steel bars, base, Toronto	4 75
Iron bars, base, Montreal	4 50
Steel bars, base, Montreal	4 50
Reinforcing bars, base	5 50
Steel hoops	6 00
Tire steel	5 00
Spring steel	8 00
Band steel, No. 10 gauge and 3-16 in. base	5 50
Chequered floor plate, 3-16 in.	8 50
Chequered floor plate, ¼ in.	8 00
Bessemer rails, heavy, at mill	
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	3 50
Structural shapes, Pittsburgh	3 00
Steel hoops, Pittsburgh	3 50-3 75
F.O.B., Toronto Warehouse	
Small shapes	5 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 67 to 5 50
Small shapes under 3"	3 62

FREIGHT RATES

Per 100 Pounds

Pittsburgh to Following Points

	C.L.	L.C.L.
Montreal	58½	73
St. John, N.B.	84½	106½
Halifax	86	108
Toronto	38	54
Guelph	38	54
London	38	54
Windsor	35	50½

METALS

	Gross. Montreal	Toronto
Lake copper	$19 00	$19 50
Electric copper	18 50	19 00
Castings, copper	18 00	19 00
Tin	44 00	46 00
Spelter	8 00	9 00
Lead	7 25	8 00
Antimony	8 00	9 00
Aluminum	34 00	35 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$ 5 50	$ 5 50
Plates, ¼ up	5 00	5 50

PIPE—WROUGHT

Standard Buttweld Pipe

Per 100 Ft.

	Steel Blk.	Steel Galv.	Gen. Wrought Iron Blk.	Gen. Wrought Iron Galv.
⅛	$ 6 50	$ 8 50	$.....	$.....
¼	5 31	7 41	5 91	8 01
⅜	5 31	7 41	5 91	8 01
½	7 10	8 63	7 95	9 48
¾	8 80	10 87	9 95	12 02
1	13 01	16 07	14 71	17 77
1¼	17 60	21 74	19 90	24 04
1½	21 04	25 99	23 79	28 74
2	28 31	34 97	32 01	38 67
2½	44 75	55 28	....	....
3	58 52	72 29	....	....
3½	74 06	90 62	....	....
4	87 75	107 37	....	....

Standard Lapweld Pipe

Per 100 Ft.

	Steel Blk.	Steel Galv.	Gen. Wrought Iron Blk.	Gen. Wrought Iron Galv.
2	$32 01	$ 38 67	$35 71	$42 37
2½	48 26	58 79	54 11	64 64
3	63 11	76 88	70 76	84 53
3½	75 90	92 46	85 10	101 66
4	89 93	107 55	100 83	120 45
4½	1 05	1 29	1 30	1 54
5	1 22	1 50	1 52	1 80
6	1 58	1 95	1 97	2 33
7	2 06	2 53	2 53	3 01
8L	2 16	2 66	2 66	3 16
8	2 49	3 07	3 07	3 64
9	2 98	3 67	3 67	4 36
10L	2 77	3 41	3 41	4 05
10	3 56	4 39	4 39	5 21

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.

4½" and larger, 50%.

4" and under, running thread, 30%.

Standard couplings, 4-in. and under, 30%.

Do., 4½-in. and larger, 10%.

OLD MATERIAL

Dealers' Average Buying Prices

	Per 100 Pounds Montreal	Toronto
Copper, light	$10 50	$10 50
Copper, crucible	13 00	12 00
Copper, heavy	12 50	12 00
Copper wire	12 50	12 00
No. 1 machine composition	13 00	12 00
New brass cuttings	7 00	9 00
Red brass turnings	10 00	10 00
Yellow brass turnings	7 00	7 50
Light brass	5 00	5 00
Medium brass	6 50	6 00
Scrap zinc	5 00	4 00
Heavy lead	5 25	4 00
Tea lead	2 50	2 00
Aluminum	16 00	13 00

	Per Ton	Gross
Boiler plate	$11 00	$12 00
Heavy melting steel	18 00	16 00
Axles (wrought iron)	25 00	20 00
Rails (scrap)	18 00	18 00
Malleable scrap	20 00	20 00
No. 1 machine cast iron	32 00	28 00
Pipe, wrought	8 50	10 00
Car wheel	30 00	30 00
Steel axles	20 00	18 00
Mach. shop turnings	8 00	7 00
Stove plate	23 00	23 50
Cast boring	8 00	10 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, 7-16 and up	Net list
Carriage bolts, ⅜-in. and less	Net
Coach and lag screws	—20
Stove bolts	55
Wrought washers	—25
Elevator bolts	Net
Machine bolts, 7-16 and over	—5
Machine bolts, ⅜-in. and less	—30
Blank bolts	**Net**
Bolt ends	—5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	**net**
Machine screws, o. and fil. hd., brass	**net**
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 50
Nuts, hex., tapped	add 3 00
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws	—20% 25 and 5
Sq. and hex. hd. cap screws	12½
Rd. and fil. hd. cap screws	plus 25
Flat but. hd. cap screws	plus 50
Fin. and semi-fin. nuts up to 1-in.	12½
Fin. and Semi-fin. nuts, over 1 in., up to 1½-in.	—5
Fin. and Semi-fin. nuts over 1½ in., up to 2-in.	+12½
Studs	+5
Taper pins	—12½
Coupling bolts	+40
Planer head bolts, without fillet, list	+45
Planer head bolts, with fillet, list plus 10 and	+55
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	+60
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	**add +85**
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$60 00
Open-hearth billets	60 00
O.H. sheet bars	76 00
Forging billets	56 00-75 00
Wire rods	52 00-70 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails, base	$5 75
Cut nails, vase	6 70
Miscellaneous wire nails	50%

ROPE AND PACKINGS

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 29
British Manila rope	0 28
New Zealand hemp	0 23

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

ATKINS

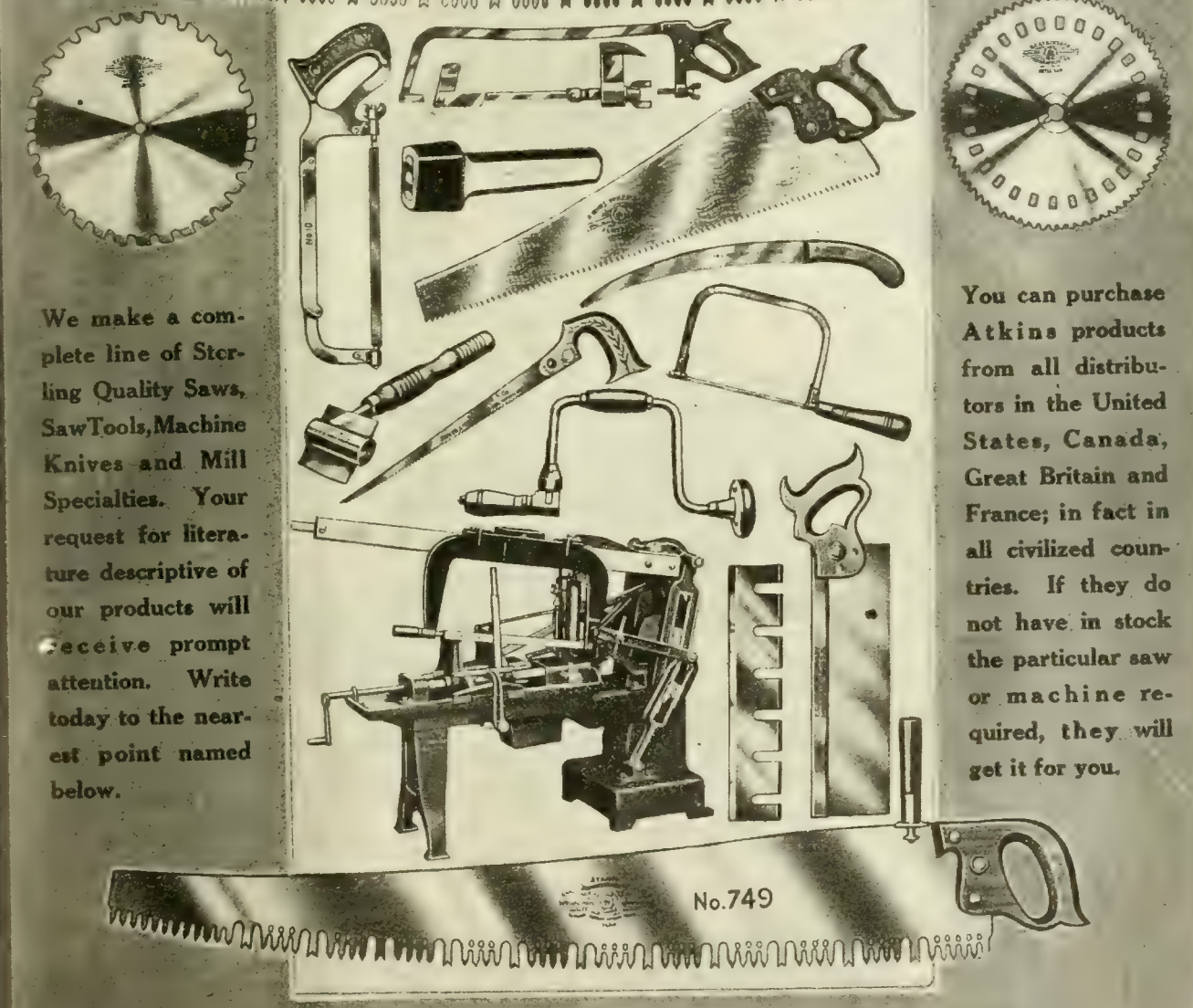
STERLING QUALITY

SAWS and TOOLS

A Perfect Saw for every Purpose

"Finest on Earth"

"Finest on Earth"



We make a complete line of Sterling Quality Saws, SawTools, Machine Knives and Mill Specialties. Your request for literature descriptive of our products will receive prompt attention. Write today to the nearest point named below.

You can purchase Atkins products from all distributors in the United States, Canada, Great Britain and France; in fact in all civilized countries. If they do not have in stock the particular saw or machine required, they will get it for you.

If you have difficulty in obtaining Atkins Saws and other products through your regular service, write

E. C. Atkins & Company

Established 1857

Canadian Factory: HAMILTON, ONTARIO

Branch: VANCOUVER, B. C.

MISCELLANEOUS

Solder, strictly	$ 0 27½
Solder, guaranteed	0 29½
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	20 35
Red dry lead, 100-lb. kegs, per cwt.	15 00
Gasoline, per gal., bulk	0 42
Pure turp., single bbls., gal.	3 15
Linseed oil, raw, single bbls.	2 37
Linseed oil, boiled, single bbls.	2 40
Wood alcohol, per gal.	4 00
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire size	40 and 5
Can. carbon cutters, plus	10
Standard drills, all sizes	40 and 5
S-fluted drills, plus	10
Jobbers' and letter sizes	40 and 5
Bit stock	50
Ratchet drills	10
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	net
Bridge reamers, carbon	50
Centre reamers	5
Chucking reamers	net
Hand reamers	10
High speed drills, list net to plus	20
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At warehouse]

Rounds and squares	$7.50 base
Hexagons and flats	7.50 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	70	80
Class B	24	34
Class C	16	24

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 8 50	$ 9 00
Sheets, blue ann., No. 10	7 00	7 50
Canada plates, dull, 52 sheets	13 00	13 00
Can. plates, all bright	14 00	.....
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	13 00	.....
Fleur-de-Lis, 28 B.W.G.	12 50	.....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28, U.S.	10 00	11 00
Premier, 10¾-oz.	10 50	11 40
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.. ..	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	28
Palacine	31
Machine oil, per gal.	58
Black oil, per gal.	27
Cylinder oil, Capital	1.01
Petroleum fuel oil, bbls., net	19

BELTING—No 1 OAK TANNED

Extra heavy, single and double	6½
Standard	6½
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 50
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	8¾
Pumice, ground	06
Emery glue	30
Tripoli composition	9½
Crocus composition	12
Emery composition	11
Rouge, silver	64
Rouge, powder, nickel	38

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 30
Brass sheets, 24 gauge and heavier, base	0 38
Brass tubing, seamless	0 42
Copper tubing, seamless	0 44

WASTE

XXX Extra	.23	Atlas	.19
Peerless	.22	X Empire	.18½
Grand	.21½	Ideal	.18
Superior	.21½	X Press	.17
X L C R	.20		

Colored

Lion	.16	Popular	.12
Standard	.14	Keen	.10
No. 1	.14		

Wool Packing

Arrow	.35	Anvil	.22
Axle	.28	Anchor	.17

Washed Wipers

Select White	.20	Dark colored	.09
Mixed colored	.10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$35 00	$37 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	40 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	43 00	46 00
Copper sheet, planished, 16 oz. base	47 00	50 00
Braziers', in sheets, 6 x 4 base	39 00	42 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 50	$14 50
Sheets, 3½ lbs. sq. ft.	10 25	14 00
Sheets, 4 to 6 lbs. sq. ft.	10 00	13 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

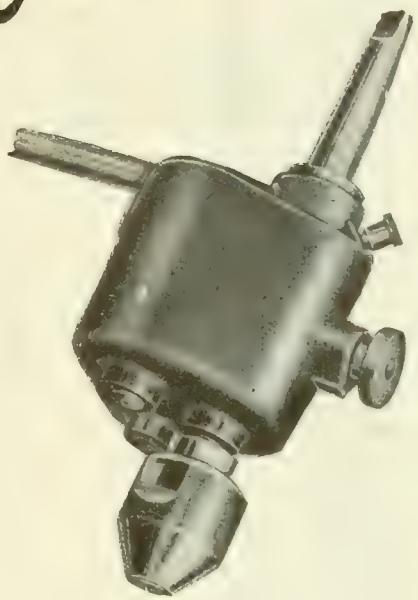
PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.04¾
Acid, nitric	.11
Acid, sulphuric	.04½
Ammonia, aqua	.15¾
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.16
Copper, carbonate, annhy	.41
Copper, sulphate	.13
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.20
Nickel carbonate	.32
Nickel sulphate	.20
Potassium sulphide (substitute)	.40
Silver Chloride (per oz.)	1.15
Silver nitrate (per oz.)	1.10
Sodium bisulphate	.13
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.39
Sodium hyposulphite per 100 lbs	9.00
Sodium phosphate	.15
Tin chloride	.30
Zinc chloride, C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated

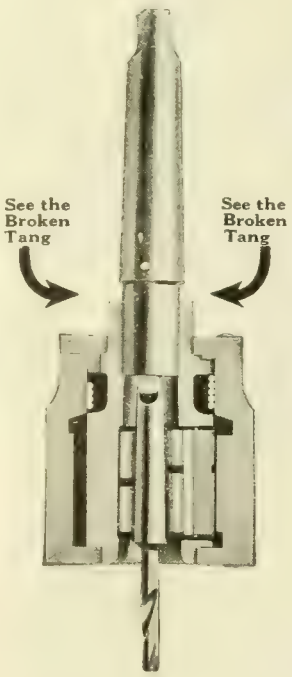
Aikenhead's

Wahlstrom Automatic Tapping Attachment



Tap breakage becomes a thing of the past when you use the Wahlstrom Tapping Attachment. The tap is prevented from jamming in the hole by keeping the lands free from chips. The chips are freed by an oscillating motion which duplicates the simple to-and-fro motion of hand tapping. For tapping in soft materials the oscillating motion can be changed to a continuous revolution.

The Wahlstrom fits any drill press. Made in two sizes. No. 1 takes taps of all sizes from 5-40 to ½ inch; No. 2 takes taps from ¼ inch to ¾ inch.



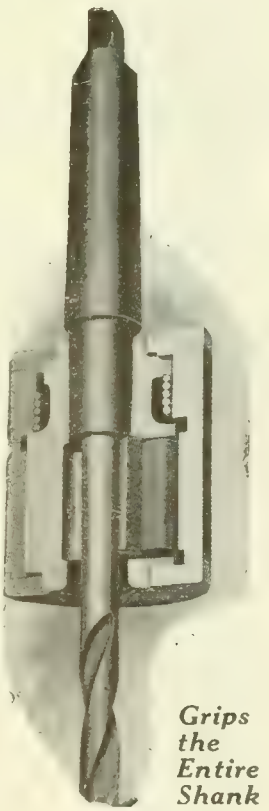
Wahlstrom Chuck

Holds Tools with or without Tangs

The instant-acting jaws of the Wahlstrom close on the entire shank with a grip which becomes firmer and firmer as the resistance of the tool increases. The clutch positively cannot slip and the jaws never break or mark a tool.

Two seconds is all you need with a Wahlstrom to change from drilling to reaming, counterboring, or tapping. Don't stop the spindle—just grasp the chuck with one hand and change tools.

Made in two different styles. One style holds Nos. 1, 2, or 3 Morse Taper Shank Drills—with or without a tang. The other style is made in three sizes, which hold all sizes of straight-shank tools from ¼ to 1 inch.



Grips the Entire Shank

Buy them at Aikenhead's
"Canada's Leading Tool Supply House"

Aikenhead Hardware, Limited
17 Temperance Street, Toronto, Ont.

If interested tear out this page and place with letters to be answered.

The Week's Events in Montreal Industry

Lieut.-Col. Gardiner of Robt. Gardiner & Sons, Montreal, who has been confined to his home for the past three weeks by illness, is now reported to be progressing favorably and it is hoped that he will soon be able to make his usual appearance at the office.

Following the fire that occurred at the foundry of W. R. Cuthbert and Company, 41 Duke street, last week, it has been announced that immediate plans have been made for the reconstruction of the building and the acquiring of equipment and machinery that will make this plant equal to any in this locality. No time will be lost in clearing away the debris and starting work on the new foundry.

J. W. Norcross, president of the Canada Steamships, who has been in England and Europe since October last, with the exception of one week that he spent in Montreal, is expected back about the end of February or the beginning of March, at which time it is estimated that there will be further developments to announce in connection with the Canada Steamships' part in the proposed British Empire Steel Corporation merger.

It has been stated that final arrangements have been made for the commencement of work in connection with the large hotel to be constructed by the Mount Royal Hotel Company, on the site of the old Peel Street barracks, near the corner of Peel and St. Catherine streets. The cost of the structure when completed will be in the neighborhood of $9,000,000, and it is anticipated that actual operations will be started by the first of April.

The Sheffield Engineering Supplies, Limited, formerly Forrest, Jackson and Forrest, of 230 Craig street west, Montreal, have acquired the Canadian selling agency for Michael and Joseph Wing Ltd., of Sheffield, England. This firm are large manufacturers of commercial iron and steel products, specializing in bar stocks for a wide and varied range of purposes. The lines include the best grades of carbon, tool, crucible and high speed steels.

The Shaughnessy shield for Eastern Canada for first-aid work in connection with the St. John Ambulance Association, was, last week, presented to the police team of the C. P. R. of Montreal. The presentation was made by Lord Shaughnessy, who emphasized the value of such training, especially for those associated with railroad work. The shields and medals have been won several times by C. P. R. teams. The team was in charge of Inspector Logan, and the members were: Capt. Wilfred Mansell, Acting Sergeant George Curtis, and Constables Arthur Hart, Percival Hawley and Jesse Holmes.

Owing to the abnormal rise in the level of the River St. Lawrence during the past week, it has been found necessary to close some of the sewer outlets, and pump the sewage through the special outlets, as there is danger of flooding by using the regular channels when the water is exceptionally high as it is at present. Officials of the city state that it is unusual to operate the pumps in January although it is frequently done during the month of December. The cause of the present rise is the blocking of the ice at the foot of the island, but precautions taken will avoid any serious flooding to streets and cellars in the vicinity.

W. D. Robb, operating vice-president of the Grand Trunk Railway, has announced the appointment of G. A. Kell, to the position of safety engineer of the system, with headquarters at Montreal. Mr. Kell has been associated with the motive power department of the Grand Trunk since his boyhood, acting in the capacity of travelling engineer for the past ten years, and is thoroughly conversant with the safety requirements of the entire system, and a large part of his new duties will be the supervision of the "Safety First" campaign among the railway employees.

Canadian Northern officials at Moncton, N.B., have been instructed to lift the embargo that has existed against the steel company, at Sydney, for the past few weeks. It is not known whether this relief is of a permanent character or only a temporary one, but the advices state that the freight will be accepted as formerly. In this connection it may be stated that reports from Sydney indicate an early settlement of the trouble between the freight handlers of the Dominion Iron and Steel Company and the officials is looked for. Owing to threatened action on the part of the Railroad Brotherhood, the situation became so serious that the steel company refrained to call upon the railway company to accept material for shipment. The atmosphere is now clearing and it is hoped that things will again be normal before the close of the month.

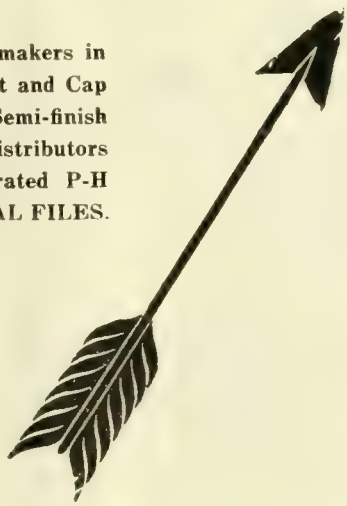
At the regular monthly meeting of the Canadian Railway Club, held in the Windsor Hotel on the night of January 11, a highly interesting paper was read by Capt. A. H. Kendall, M. C., O. C. 58th Broad Gague Operating Company, C.E.F. (now master mechanic of the C.P.R. at Montreal.) The title of the paper was "Operating Broad Gauge Railways in France Under War Conditions," and the large number of members attending showed quite clearly, the extreme interest taken in this interesting and instructive paper. The annual dinner of the Railway Club will be held in the Windsor Hotel on the night of the 29th of January, when it is expected that W. H. Taft, ex-president of the United States, will be the principal speaker. The Hon. F. B. Carvell, chairman of the Board of Railway Commissioners, has accepted the invitation to respond to the toast of the railways. Stephen Leacock will be on hand to reply to the toast of our guests.

A movement is on foot in certain quarters to secure the Foundrymen's Convention for Canada next year. The matter was discussed at the last convention in Columbus and Montreal mentioned, and as is usual when the name of a city is put forward as a possible meeting place for some future convention, the suggestion was favorably received at the time. Mayor Martin of Montreal has been approached on the subject and has promised his hearty cooperation, and it is understood that he is taking the matter up with the Prime Minister personally, to arrange for the elimination of red tape on custom duties etc., in getting American exhibits over the border. The question of securing a suitable hall for exhibition purposes is also under consideration. The Arena has been suggested but it is probably too small for the purpose. It is thought that the drill hall on Craig street can offer the largest amount of floor space available in the city for the necessary exhibit of foundry equipment. We understand that Mayor Martin, once these difficulties have been removed, will extend an official invitation in the name of the city of Montreal to the officers of the Foundryman's Association in Chicago. The possibility of the Convention being held in Montreal has aroused considerable interest, and all-around approval in Canadian foundry circles, and they promise to extend the good hand of fellowship to their American brothers if the convention is held in their city and further assure them that they will find many of their compatriots here, if one can judge by what occurred last summer, when the streets of Montreal were filled with visiting American tourists and convention delegates drawn there by reasons which are said to be not entirely unconnected with the 18th Amendment to the Constitution of the United States.

MORROW DRILLS WILL SOLVE YOUR HOLE PROBLEMS

More Holes with Less Regrinding!

Also largest makers in Canada of Set and Cap Screws and Semi-finish Nuts. Sole distributors of the celebrated P-H and IMPERIAL FILES.



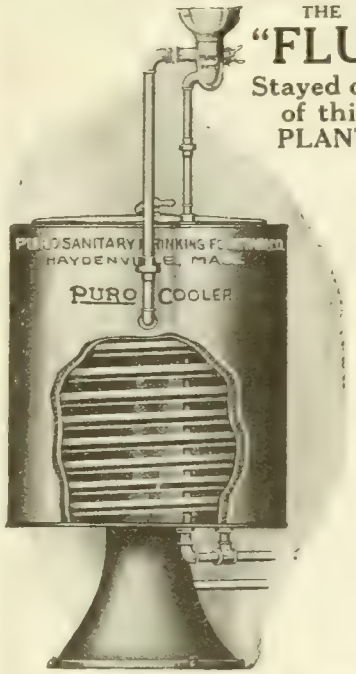
Please Note Our New Montreal Address:

JOHN MORROW SCREW & NUT COMPANY, LTD.
489 St. Paul St. W.
MONTREAL, QUE.
Telephone Main 8414

Works at

INGERSOLL

If interested tear out this page and place with letters to be answered.



THE "FLU" Stayed out of this PLANT

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

The only fountain with a bowl that prevents lips touching the bubbler paid its moderate cost over and over in all those well-ordered plants whose precautionary measures successfully barred the Spanish influenza. PURO saves lives, time and water. Write

Puro Sanitary Drinking Fountain Co.

888 F. St. Andre St., Montreal, P.Q., Canada

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Fetherstonhaugh & Co.,
The old established firm. Patents everywhere. Head office Royal Bank Bldg., Toronto. Ottawa office, 5 Elgin St. Offices throughout Canada.
Booklet Free.

PATENTS PROMPTLY SECURED

In all countries. Ask for our Investor's Advisers which will be sent free.

MARION & MARION 364 University St.

Merchants Bank Building, corner St. Catherine St., Montreal, Phone Up 647, and Washington, D.C., U.S.A.

HIGH CLASS Machine Tools FOR SHIPYARDS AND CONSTRUCTIONAL WORKS

BERTRAMS LIMITED
SCIENNES EDINBURGH

BLACK DIAMOND FILES

OVENS

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Brantford Oven & Rack Co. Ltd.
Brantford, Canada

BLACK DIAMOND FILES

HAMILTON ENGINEERING SERVICE LIMITED

Consulting and Designing — Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.

17 MAIN ST. EAST, HAMILTON

DROP FORGE DIES

Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.

THE KIMBER & HILLIER MFG. CO.,
Thorold Road, - St. Catharines, Ont.

RATES FOR CLASSIFIED ADVERTISING

Rates (payable in advance): Two cents per word. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

Unique Order.—Eleven vessels, ranging in size from gas boats to big stern wheelers over 200 feet in length, with a total value of well over $200,000, will be built in Vancouver for the Hudson's Bay Company for operation on the Mackenzie River during the coming spring and summer months, according to information given by an official of the company who is making arrangements for the commencement of the work.

Engineering

The H. Mueller Mfg. Co., Sarnia, are contemplating a large extension to their plant.

The erection of a steam heating plant is planned by the Chatham Steam Heating Co.

Erection of a warehouse is being planned at Regina, Sask., by the McColl Bros., Ltd., Toronto.

The Dyrob-Steel Co., Orillia, Ont., has decided to proceed at once with the erection of a factory.

Arrangements are being made to enlarge the plant of the Tuttle-Bailey Mfg. Co., of Bridgeburg.

The London Concrete Machinery Co., London, Ont., are erecting a $50,000 addition to their factory.

The erection of a paper mill is being planned by the Provincial Paper Mills, Ltd., Port Arthur, Ont.

A storage shed will be built by the Warren Bituminous Paving Co., Ltd., 19 Melinda Street, Toronto.

A new memorial hospital is to be erected in Whitby next year on the site of the Perry Castle Block.

Plans are being made by the Canada Cement Co. to erect a large office building on Phillips Square, Montreal.

The Government Telephone Commission, Ochre River, Man., are about to erect a telephone exchange building.

The Transparent Rubber Co., 1555 Danforth Ave., Toronto, was gutted by fire on Saturday, January 15. The loss is estimated at $24,000.

The Bell Telephone Co. plans to expend $10,424,412 this year on new plants, including $3,535,518 in Toronto, $228,200 in Hamilton and $453,000 in Ottawa.

Plans are being made by the General Public Hospital Commissioners at St. John, N.B., to alter and build an addition to the hospital at a cost of $500,000.

The Brantford Computing Scales, Ltd., Brantford, Ont., have erected a new factory with foundry attached. Operation will begin in about two months' time.

The Corbet Foundry & Machine Co., 1064 First Ave. West, Owen Sound, Ont., intend enlarging their plant by an addition to cost $25,000. Tenders will be called in the spring.

The plant of the Woodstock Worsted Knitting Co. has been acquired by the American Ironing Board Co. for a Canadian branch. A twelve months' lease has been taken with the option to buy at the end of that time.

J. R. Royer, 118 Murray Street, has been awarded the general contract for the erection of three-story factory for Goupil Ltee, 9 Alexandre Street, Sherbrooke, Que., at a cost of $30,000.

New tenders will be called in the spring by F. J. Wolfe, district representative of the Imperial Oil Co., for erection of warehouse, garage and stables at Riviere du Loup, Que.

The general contract for the erection of a factory costing $20,000 for the Dominion Canners, Ltd., Niagara Falls, has been awarded to J. D. Nichols, 116 Summer Street.

Preliminary operations for the erection of the new station, train shed and viaduct for St. John, N.B., for the Canadian National Railways have been recently commenced.

S. R. Cound, general manager of the Baldwin Canadian Steel Corporation, left on January 17 for New York en route to England for three months' leave. The departure of the general manager follows close upon the first production of tin plate in the big plant. Mr. Cound has been devoting his energies to this work for some time.

Trade Gossip

Morden Retires?—The retirement of Col. W. Grant Morden, M.P., from the nominal position of chairman of the board of directors of the British Empire Steel Corporation will, it is expected, shortly be announced by Roy M. Wolvin, president of the Dominion Steel Corporation, who went to England recently with D. H. McDougall, president of the Nova Scotia Steel & Coal Corporation, in connection with the merger reported to have dwindled down to these two concerns. It is stated, in fact, that Col. Morden's connection ceased some time ago, although there has been no official confirmation of this.

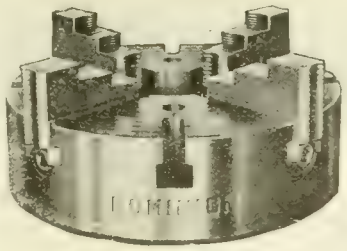
Personals

I. Swales has been appointed to the position of general manager of the Chapman Double Ball Bearing Co., Ltd., Toronto.

Thos. Southworth, managing director of the Deloro Smelting & Refining Co., Ltd., together with F. A. Bapty, secretary-treasurer of the same company, spent several days this week in New York city on company business.

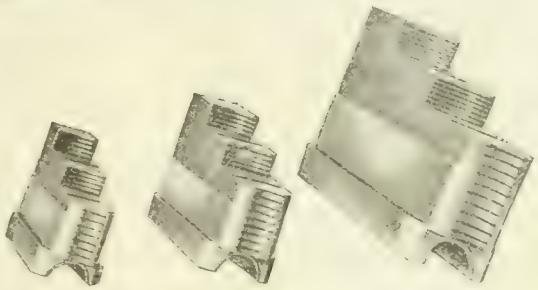
E. W. Sawyer has resigned his position of general manager of the Dominion Abrasive Co., Ltd., Mimico. Mr. Sawyer has held the position since the inception of this concern in 1920. Their plant was then located in New Toronto.

Steel Tenders Wanted.—W. A. McLean, Deputy Minister of Highways for Ontario, is advertising for tenders for reinforcing steel. Sealed tenders, marked "Tender for Contract No. 309," will be received by him until 12 o'clock noon on Tuesday, February 1st, 1921, for the supply of approximately 250 tons of round steel, reinforcing bars for culverts, and of expanded metal for bridge floors. Delivery will be required prior to May 1st, 1921. Specifications may be seen on and after Friday, January 14th, 1921, at the office of Mr. McLean, Parliament Buildings, Toronto.



DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



The Jaws Are Extra Strong

THEY are drop forgings, made of best quality steel, heat-treated and hardened. The threaded portion of jaws form a half nut for the setting-up screws. Have stood the test of heavy duty work in our own shops where accuracy was the only accepted standard.

DOMINION STEEL PRODUCTS CO.
LIMITED
Engineers • Manufacturers
BRANTFORD, CANADA

3

MADE ADVANCES AFTER CLOSE STUDY

John J. Main Was Inventor of Note—Passed Away in Toronto Recently

John J. Main, inventor of the Heine boiler, and one of the outstanding figures in Canadian foundry circles, died at his home, 40 Prince Arthur Avenue. He had been ill a long time, and death folloewd a stroke, the fifth of its kind.

Mr. Main was born on the island of Jersey 70 years ago. He came to Canada as a young man, and for years worked at his trade as a boilermaker. It was the invention of the Heine boiler which gave him his real start in life. He became connected with the Polson Iron Works, rose rapidly, and when he retired three or four years ago was vice-president and general manager.

During the war Mr. Main served on the Imperial Munitions Board. Free of charge, he turned over to the military authorities his patents on boilers fed with crude oil, which were used extensively in many branches of the service.

Mr. Main was president of the Canadian Incinerator Company, president of the Policy Holders' Mutual Life Insurance Company, and a director of the Dominion Radiator Company. He was superintendent of the Doty Engine Company, John Inglis & Sons and the Bertram Engine Works at various times during his career.

WILL FIGHT THE DECREASED WAGE

Twenty Per Cent. Reduction Is Cause of Trouble in the Sydney Field

That they will fight by every legitimate means in their power the 20 per cent. wage reduction ordered by the Dominion Iron & Steel Corporation was the decision reached at a mass meeting of Steel Workers' Union, Sydney, N.S. Speaker after Speaker took the floor and declared that there was nothing in either the cost or price of steel or in the trend of the cost of living to justify the drastic wage cut proposed by the Steel Corporation.

An effort will first be made, it is said, to induce the company to change its announced purpose of making the 20 per cent. cut, but if negotiations in this direction fail, then an appeal will be made direct to the Federal Government.

Classified Opportunities

MACHINERY WANTED

WANTED—ONE PORTABLE FLOOR CRANE and hoist lift, 7 feet or over. W. G. Utley, Yarmouth, N.S. (c2m)

WANTED—NEW AND RE-MANUFACTURED gas and gasoline engines, boilers, saw-mill machinery, planing mill and sash and door factory machinery. New and manufactured iron and wood-working machinery. Electric motors, dynamos, direct connected steam operated generators, portable electric tools. Builders' hoists, elevators. Box 739F, Canadian Machinery.

IF YOU HAVE IRON-WORKING OR WOOD-working machines for sale, or idle machine shop equipment, call or write Canada's largest dealers in new and used machinery. H. W. Petrie Limited, Toronto, Ont. (cfm)

WANTED — WOODWORKING MACHINERY and mining machinery, machine tools, boilers and steam pumps, alternating or direct current motors. Contractors' equipment. Apply Box 737F, Canadian Machinery.

WANTED FOR CASH -- MACHINE TOOLS, woodworking machinery of every description. The A. R. Williams Machinery Co., Toronto. (cfm)

MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES shapers, milling machine and planer, etc Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (etfm)

IN WRITING ADVERTISERS, PLEASE MENTION THIS PAPER.

Machinery Wanted

Advertisements under this heading will be inserted once free of charge. Readers are invited to use this department when in need of equipment. Replies may be sent to box number, care of Canadian Machinery, if desired.

What can we do for YOU?

Through these columns thousands of dollars of equipment are disposed of each year. If you are not using Canadian Machinery now, let us tell you what others have done—are doing.

CANADIAN MACHINERY
Classified Advertising Section
143 University Ave., Toronto

FOR SALE

ENCLOSED LIQUID FUEL COMBUSTION APparatus capable of generating intense heat in pipes and confined passages for heating parts of internal combustion engines and for other uses; spark ignited; blower operated. Patented October 8th, 1918. Can be inspected at and for sale by H. W. Petrie, Limited, 131 Front St. W., Toronto.

H. R. T BOILERS—

1—125 H.P., 72" x 16', 125 LBS
2—100 H.P., 66" x 16', 125 LBS.
2—100 H.P., 66" x 16', 80 LBS.
2—70 H.P., 60" x 14', 120 LBS.
1—45 H.P. 42" x 14', 130 LBS.

COMPLETE PARTICULARS AND PRICES ON application.
WILSON-McGOVERN, LIMITED, LUMSDEN Building, Toronto. (cfm)

CANADA MACHINERY CORPORATION, LTD., manufacturers of machine tools for wood and iron. Call at our Toronto showrooms, Brock Ave. subway. Telephone Parkdale 3558. Head office and works, Galt, Ont. Canada Machinery Corporation, Ltd. (cfm)

CASTINGS

Medium and light, grey iron castings for manufacturing purposes. We carry bushings, solid and cored, from 1 in. to 6 in., or larger.

TORONTO FOUNDRY CO.
1884 Davenport Road, Toronto
(c5m)

Grey Iron Castings

Light and Medium Bench and Floor Repetition Castings Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill of Castings supplied if required
ASK US.
THE KATIE FOUNDRY, GALT, ONT.

Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

Used Machinery For Sale

1—24" Smith & Mills Shaper
1—3' Bickford Radial Drill
1—26" x 36" x 10' Bertram Planer
1—36" x 36" Jones & Lamson Turret Lathes
1—24" x 24" Jones & Lamson Turret Lathe
1—15" x 6' South Bend Lathe.
1—18" x 8' Stevens Lathe
2—18" x 8' Mueller Lathe, Q.C.G.
1—18" x 8' Cincinnati Lathe, Q.C.G
1—26" x 12' C.M.C. Lathe, Q.C.G.
1—26" x 48" x 14' McCabe Double Spindle Lathe
We are offering the above machines at attractive prices for quick sale

Charles P. Archibald & Co.
Machinery and Supplies
285 Beaver Hall Hill Montreal

PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (otfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (etfm)

HELP WANTED

GENERAL MANAGER REQUIRED IMMEDIately for small engineering works in Ontario employing about 100 men and comprising machine shops and grey iron foundry manufacturing machine moulded castings; must be thoroughly experienced in this class of work and competent to take entire charge, including office and sales end of the business; preference given to one having experience in agricultural machinery; good prospect for energetic man; apply, stating age and salary required and give references; applications will be treated in confidence. Box 745, Canadian Machinery. (c4m)

POSITIONS WANTED

DRAUGHTSMAN (PERTH COUNTY) DESIRES change. Have had general experience of ten years. Am first-class practical shop mechanic, age 30. Married. If you are in need of a young man of ability, who has risen by merit only, let us arrange an interview. Address Box 747, Canadian Machinery (c6m)

PATTERNS

Wragge's Pattern Works, 10 George St. South, Galt, Ont., Phone 1105 W. Equipped for best service in wood or metal patterns to any specification. Most reasonable prices. Expert workmanship. "Nothing ragged but the name." (cxxvi3m)

CANADIAN MACHINE SHOP

—

Will handle medium Specialty Line — Manufacturing and Selling

—

Apply Quickly
Box No. 715F
CANADIAN MACHINERY

Classified Opportunities

Machinery Agencies Wanted

A well established machinery supply house in Nova Scotia, covering the entire province, which has been handling American machinery, would like to hear from Canadian manufacturers of the following lines:—

Woodworking Machinery
Ironworking Machinery
Contractors' Machinery
(Hoists, Mixers, etc.)
Pumps
Electric Motors

Address:

MACHINERY
P.O. Box 847
HALIFAX

An Unusual Lot of Rebuilt Machines of the Better Kind at a Saving of Fifty Cents on the Dollar

LATHES

3 28" x 12' Boye & Emmes, 3 step cone, D.B.G.—G.C.G.
6 24" x 12 Boye & Emmes, 3 step cone, D.B.G.—G.C.G.
3 24" x 10' Boye & Emmes, 3 step cone, D.B.G.—G.C.G.
1 24" x 8' Boye & Emmes, 3 step cone, D.B.G.—G.C.G.
2 20" x 8' Boye & Emmes, 3 step cone D.B.G.—G.C.G.
3—26" x 12' C.M.C., 3 step cone, D.B.G.—G.C.G.
2 26" x 10' C.M.C., 3 step cone, D.B.G.—G.C.G.
1 24" x 12' C.M.C., 3 step cone, D.B.G.—G.C.G.
1 20" x 10 C.M.C., 3 step cone, D.B.G.—G.C.G.
1—18" x 8' C.M.C., 3 step cone, D.B.G.—G.C.G.
1—14" x 6' American, 3 step cone, S.G.G.—G.C.G.
2—18" x 8' Mueller, 3 step cone, D.B.G.—G.C.G.

MILLING MACHINES

1 No. 2 Kempsmith, full universal with dividing head, complete and in first-class condition.
1 No. 1½ Cincinnati Universal, complete with regular equipment.
1 No. 2 Ford Smith, complete with dividing head and vice.

DRILLS

1 Barnes 15" Drill, lever feed with countershaft.

TURRET LATHES

1—No. 1 Wood tilted, power feed, 1½" capacity.

The above are only a few items from our large stock, which consists of boilers, engines, pumps, motors, compressors, in fact everything in machinery.

What are your requirements? They interest us give us the opportunity to quote you will save fifty cents on the dollar.

R. S. HOLLY
Room 37, 33 Richmond Street West
TORONTO - ONT.
Telephone Main 4728

PARTIAL LIST

12" Pond Car Wheel Lathe, Motor Drive
36" x 22' Bridgeford, g. h. Motor Drive.
36 x 16' Sidney, D. B. G., Q. C., new
27 x 14' Sidney, D. B. G., Q. C., new
14" to 21" x 6' to 12' Sidney
13" to 15" x 6' to 12" Carrol-Jamieson

Large Stock-used Lathes

40 x 40 x 10' Powell, 2H Planer
24 x 24 x 5' Pease 1H Planer
16 x 16 x 42" Walter, 1H Planer
14" Steptoe Shaper
16" x 20" x 24" Steptoe, B.G., new Shaper
7" Rhodes, Precision, new Shaper
16" Used Smith-Mills Shaper
16" Used Kelley, B. G. Shaper
No. 4 Brown and Sharpe, Plain Miller
No. 24 Osterlein, Plain Miller
No. 22 Garvin, Vertical Miller
No. 2 M. U. Garvin, Universal, new Miller
No. 1 Dow, Plain, new Miller
No. 3 Burk Hand Miller
No. 3½ Fox Hand Miller
6' Western Universal Radial Drill
3' Mueller, Plain, Radial Drill
42" Canedy-Otto Plain, new Drill
3 Spindle Barnes, B.G. Drill
No. 1 Caplin Keyseater
No. 4 Caplin Keyseater
No. 0 Baker Keyseater
10" x 36" Norton Plain Grinder

WRITE FOR FULL LIST OF MACHINE TOOLS, MOTORS, WOOD-WORKING MACHINERY

FRANK TOOMEY INC.
127 North Third Street PHILADELPHIA, PA.

PARTIAL LIST OF MACHINE TOOLS FOR IMMEDIATE DELIVERY

AH

LATHES

Alfred Herbert Hexagon Turret Lathes for bar work for 1⅝" and 2¾" dia. bar.
Alfred Herbert Combination Turret Lathes, 13", 20", 22" swing.
Springfield 16", 18", 20" cone pulley and geared head Engine Lathes.
48" x 24' bed Tangye Geared Head Lathe.

DRILLING MACHINES

12" Pollard Bench Drills.
1, 2, 3 and 4-spindle Herbert Ball Bearing Drills.
20", 22", 24", 27" Pollard Upright Drills.
36" Pollard Sensitive Radial Drill.
6' Tangye Radial Drill.

SHAPERS

16" Milwaukee..

PLANERS

24" x 24" x 6' Stirk Planing Machine.
60" x 60" x 16' Stirk Planing Machine.

MILLING MACHINES

No. 3 Herbert Horizontal Cone Pulley, 21" x 7" x 16".
No. 16 Herbert Horizontal Single Pulley, 34" x 13½" x 20".
No. 1 Herbert Vertical Cone Pulley, 30" x 12½" x 20".
No. 16 Herbert Vertical Single Pulley, 34" x 13½" x 21".
No. 8 Herbert Vertical Cone Pulley, 62" x 38" x 28½".

We solicit your enquiries for Machine Shop Equipment

ALFRED HERBERT, LIMITED
1-3 JARVIS ST. TORONTO

Classified Opportunities

GARLOCK-WALKER LIST

If You Want Machine Equipment, Send Us Your Enquiries

We have one of the largest stocks of new and used metal and woodworking machines in Canada.
Many machines only very slightly used and all absolutely guaranteed.
A few machines from our Toronto stock at exceptionally attractive prices are:

AIR COMPRESSORS

1 8" x 11½" x 3 American Steam Pump Co., motor driven (used).
1—8" x 8" Sullivan Class "W.G. 3." Belt driven (used).
1 12" x 12" Bury Class "L." Belt driven (used).
1 8" x 8" x 10" Bury, steam driven (used).

DRILLS

1 10" Burke Sensitive, bench type (new).
20" "Sibley" Champions, Rockwell, and Silvers (new and used).
1—36" C.M.C. Heavy Duty (used).
1 3-spindle 20" Silver Gang Drill (used).
1—4-spindle W. & R. Sensitive (used).
A number of smaller sizes in bench and column type.

BORING MACHINES

1—66" Bement-Niles Vertical, 2 head, 24" under rail (used).
1 Universal No. 2½, Horizontal, table 12' x 22" (used).
1 Bullard "New Era" 36", complete equipment (new).

GRINDERS

1 "Landis" No. 1 Universal (used).
1 "Landis" Plain, self contained 36" x 12' (used).
1 "Norton" Plain, No. 434 (used).
1—"Fitchburg" Cylindrical, 8" x 36" (new).
Several "Globe," "Stevens," "LeBlond" and "Cincinnati" Cutter Grinders (new and used).

SHAPERS

1 14" "Mackenzie" B.G. Crank Shaper (used).
1—16" "Rae" B.G. Crank Shaper (used).
1—24" "MacGregor G" B.G. Crank Shaper (used).

LATHES

1—7" Cataract Precision (used and new).
1 12" x 8' "LeBlond" Tool Room (used).
1—16" x 6' "Reed" (used).
1—18" x 8' "Rae" Q.C.G. (new and used).
1 24" x 10' "Milwaukee" (new).
1—30" x 12' "Blaisdell" (used).

GAP LATHES

1—12" x 17½" x 6' Perfect (used).
1 20" x 38" x 12' C.M.C. (used).
1—21" x 30" x 7' South Bend (used).
1 22" x 10" x 16' McDougall (used).
1—38" x 54" x 12' Bertram (used).

TURRET LATHES

No. 1 Milwaukee, capacity 1¾" (used).
Several Oliver & Davis Turrets, various capacities (used).

PLANERS

1 42" x 42" x 20' Putnam, 1 head (used).
1—30" x 30" x 10' Pond, 1 head (used).
1—24" x 24" x 6' Powell, 1 head (new).

MILLING MACHINES

1 Whitney Hand Miller, 18" x 6" table (used).
1—Briggs High Duty Type "A," 22" Traverse (new).
1—Briggs High Duty Type "B," "42" Traverse (new).

POWER HACK SAWS

1 No. 10 Racine 8" x 8" cap. (new).
1 Peerless 6" x 6" cap. (used).
1—No. 7 Watkins 9" cap. 18" blade (used).

MISCELLANEOUS

1—Arbor Press No. 4 "Greenard" (new).
1 Riveting Machine No. 80-B, "Grant" (new).
1—Riveting Machine No. 81-A, "Grant" (used).
1 High Speed Hammer No. 3-A (used).
1 Rotary Bevel Shear, "Lennox," 1" cap. (new).

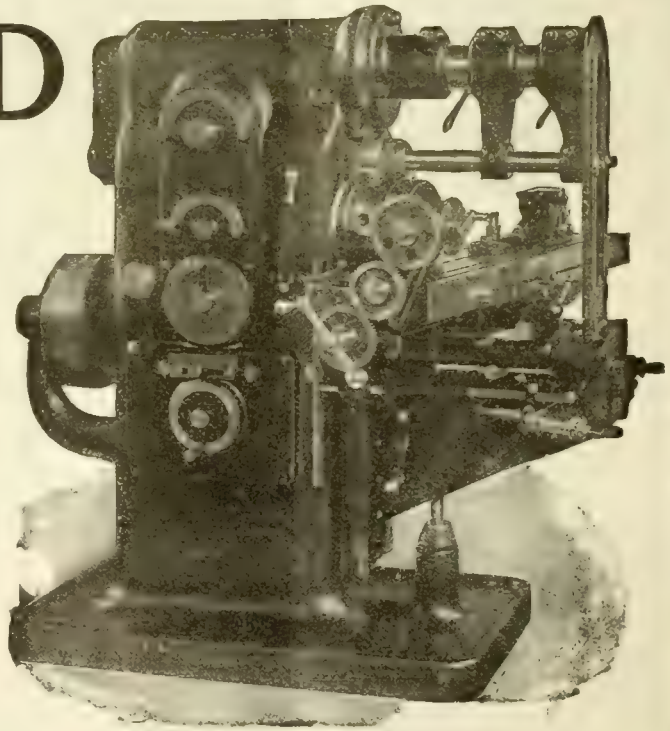
GARLOCK-WALKER MACHINERY CO., LIMITED

MONTREAL, 337 St. James St. **TORONTO, 32 Front St. W.** **WINNIPEG, 567 Banning Ave.**
Warehouse: 163 Dufferin Street, Toronto

Saves Time, Labor, Expedites Production

ROCKFORD Milling Machine

Its speed, simplicity of operation and great utility Assures Big Profits in whatever work it is used.



And another profit-makinig feature of the "Rockford" Miller lies in its unusual capacity to do all classes of work.

In the tool room, in the shop, in the manufacturing or jobbing establishment this "Miller" is beyond comparison.

Has Power to Spare

Put the power of the "Rockford" to the severest tests. It's built to more than meet the demands likely to be made upon it. It is the pace-maker of the machine shop.

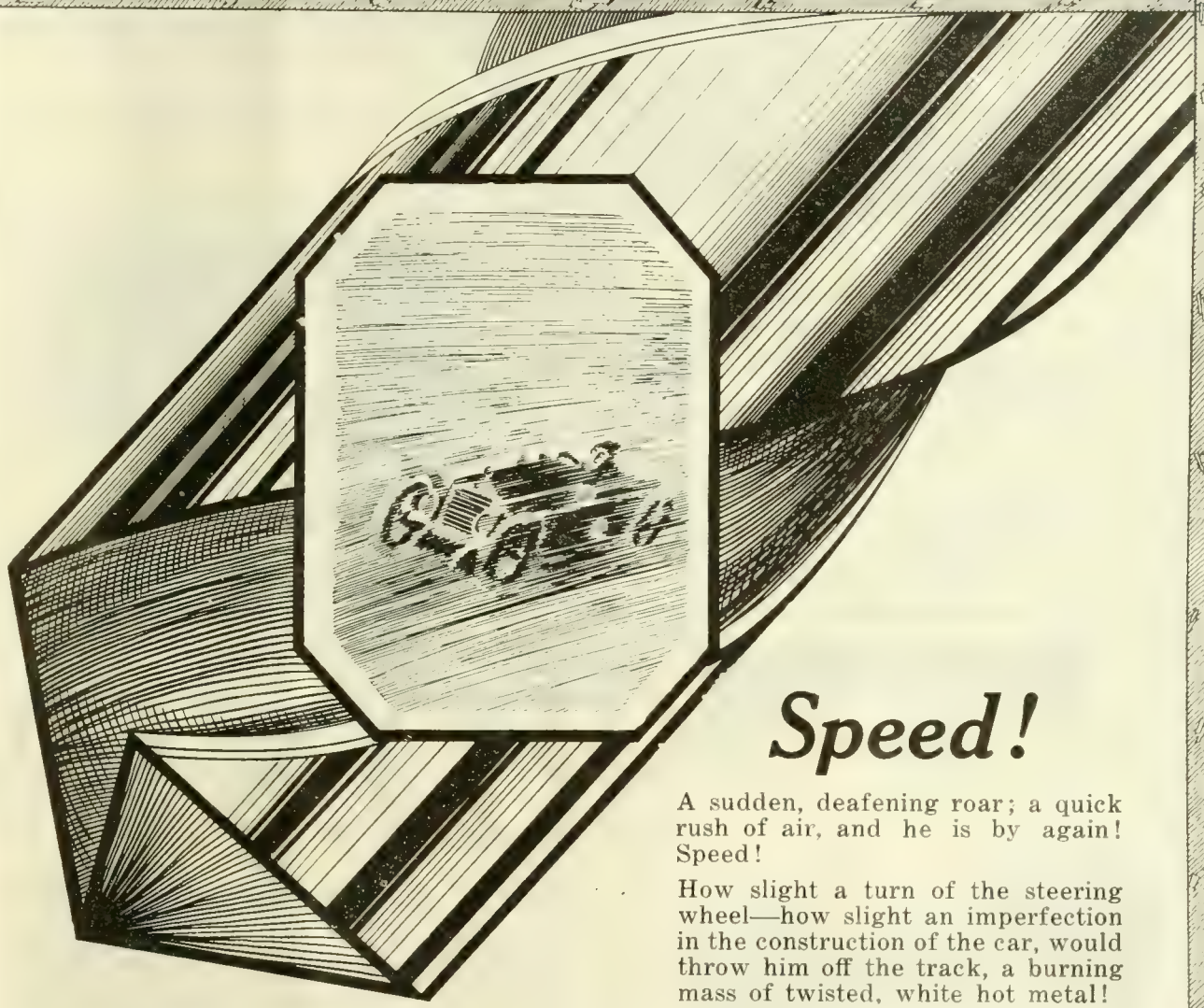
Look into the merits of this machine. Write to us without delay.

ROCKFORD MILLING MACHINE COMPANY, ROCKFORD, ILL.

Canada: Rudel-Belnap Machinery Co., Toronto, Ont.

FOREIGN REPRESENTATIVES: Great Britain, A. A. Jones & Shipman, Ltd., Leicester, England. France and Belgium, Louis Besse, Paris, France. Italy and Colonies, Societa Anonima Adler & Co., Milano. Scandinavia, Rylander & Asplund, Stockholm, Sweden. Spain and Portugal, Casamitjana Hermanos, Barcelona, Spain. Australia, Selson Engineering Co., Melbourne, Australia. Russia, M. Mett Engineering Co., Petrograd, Russia.

IMCO TOOLS



Speed!

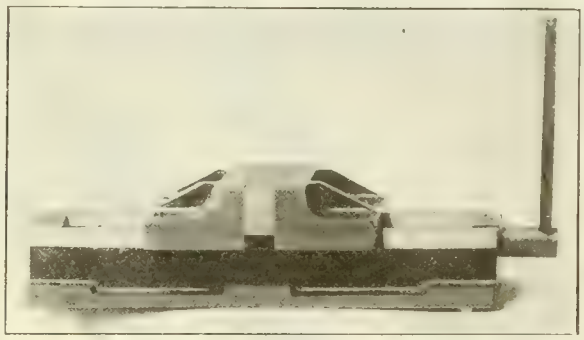
A sudden, deafening roar; a quick rush of air, and he is by again! Speed!

How slight a turn of the steering wheel—how slight an imperfection in the construction of the car, would throw him off the track, a burning mass of twisted, white hot metal!

Makers of good cars use "Imco" Tools in their construction. Experience has taught them that "Imco" is the sure way of getting precision cutting.

Ingersoll Machine & Tool Co., Ltd.
Ingersoll, Ontario.
Toronto Office — 80 Bay St. Phone Adelaide 7227.
Chas. A. Strelinger Co. Ltd. Windsor, Ont.

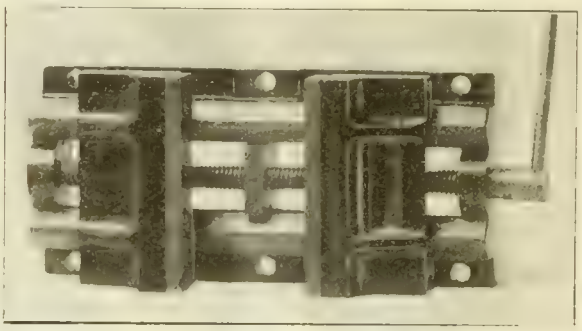
THE VISE YOU HAVE BEEN LOOKING FOR—
For LATHE, SHAPER, MILLER and DRILL PRESS



VISE can be used flat or on side as shown, allowing holes to be drilled at right angles without removing work from vise.

Can be used on lathe face plate as chuck.

NOTE—Jaw slides being angled on both sides, which allows cutting to fall off and not get ground into slides.



FEATURES:

QUICK ACTION with increased power.

JAWS always centrally located on body, independent of size of work held.

LIVE GRIP on both jaws, and no loss of power through thrust collars.

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GUELPH, ONTARIO

AGENTS WANTED
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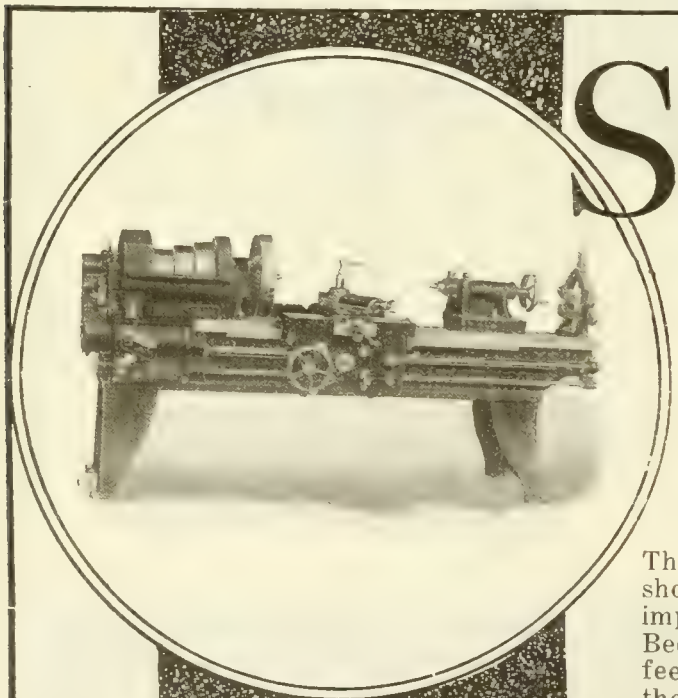
SIDNEY
Heavy Duty Engine Lathes
Noted for Their Power and Rigidity



"Sidney for Service"

One of the outstanding features of the Sidney is the manner in which it takes deep cuts through tough metals. Clean cuts without chatter, without pause. The Sidney is so designed that rigidity is maintained under severe conditions, and, in normal service.

The 25-inch Heavy Duty Quick Change Sidney here shown is the last word in lathe construction. Every improvement will be found in this, the latest model. Bed lengths available are: 10, 12, 14, 16, 18 and 20 feet. 27-inch swing design can also be supplied in these lengths.

The specific details of the Sidney are given in our new Bulletin. Write for your copy to-day.

The Sidney Tool Co., Sidney, Ohio

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1—BERTRAM VERTICAL EXTENSION TYPE BORING MILL. Swings 11′ when closed, 20′ when extended. Takes 7′ 6″ under tools. Has 2 heads on rail and auxiliary boring head. Excellent condition.

1—8′ UNIVERSAL RADIAL DRILL. Spindle 4″ dia. with plain box table. Base of "T" pattern 12′ x 4′ 3″. Belt driven. Splendid condition.

2—12′ WALL RADIAL DRILLS. (Countersinking drills.)

1—BERTRAM 6-SPINDLE INDEPENDENT-FEED DRILL. Spindles 2¼″ dia. Feed 13″. Table 12′ 3″ x 24″. Nearly new.

1—1,500-lb. BEMENT DOUBLE FRAME STEAM HAMMER. Complete with operating valve, anvil, etc.

1—30′ x 12′ x 8½′ IRON PLANER. 2 heads on rail. Table 29′ between pockets x 8′ wide. Heavy cored section housings.

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1—BERTRAM DOUBLE END PUNCH AND SHEAR. 42″ throat. Will punch 1½″ in 1⅛″ plate. Shear 8″ x 1″ flat. Excellent condition.

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1—54″ McDONOUGH HORIZONTAL BAND RESAW, with bevel siding attachment. Has power feed and will take stock up to 30½″ wide x 12″ thick. Takes 7″ saw.

1—No. 640 AMERICAN EIGHT-ROLL "BOSS" TIMBER SIZER. Will surface all four sides on timber up to 30″ x 20″. Has 6 rates of feed. Furnished with forged steel cylinders, chipbreaker, etc. Belt driven.

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The Norton floor stand has this sturdiness combined with points of safety and adaptability for foundry grinding.

The operator is not put to any strain. Work-rests of ample dimensions relieve him of holding the work.

With a Norton wheel the working combination is ideal. "Alundum" for materials of high tensile strength, all kinds of steel. "Crystolon" for cast iron, bronze, brass and aluminum.

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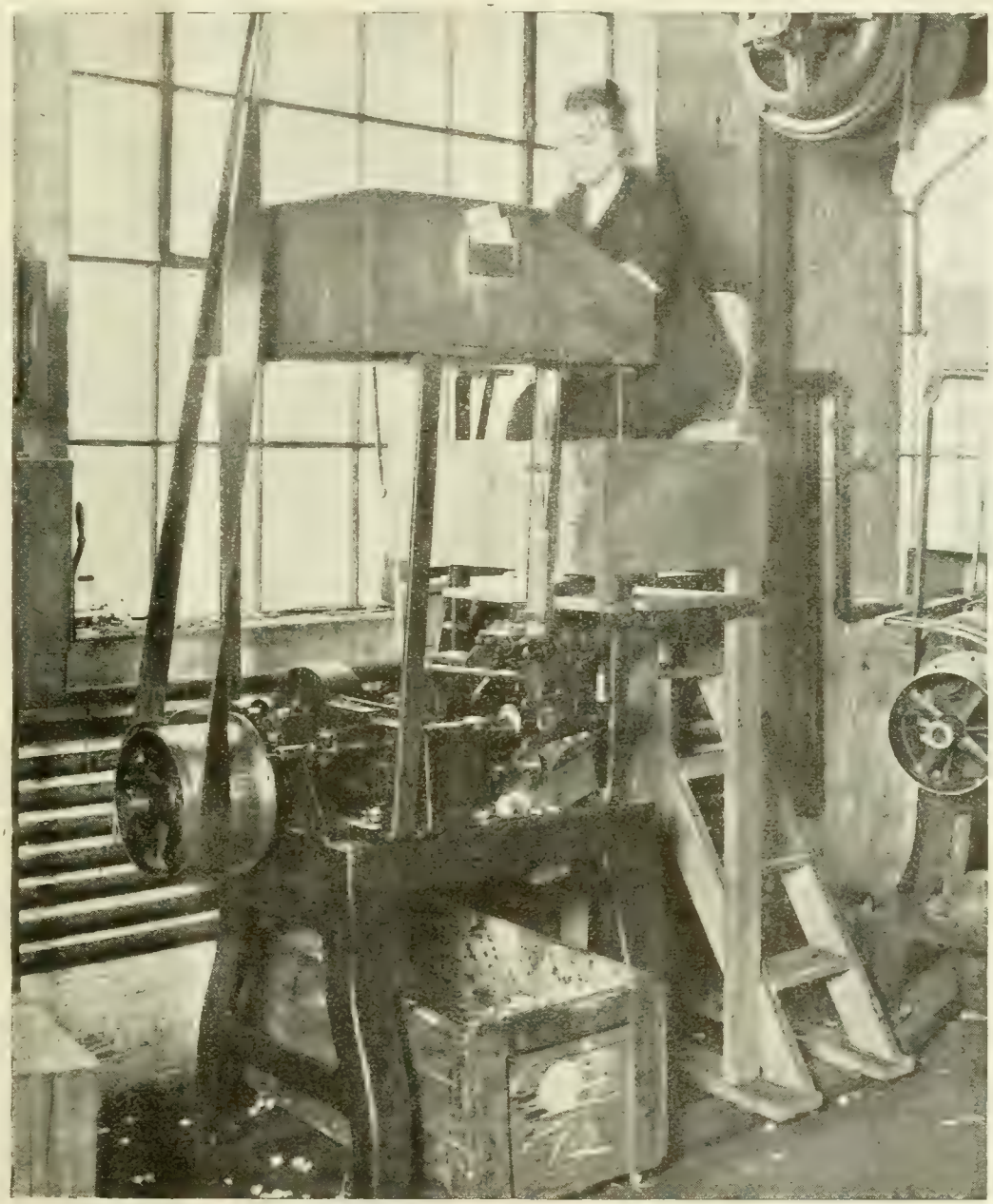

Gravity is put to work in order to keep pace with this "Bliss" No. 118 Automatic Thread Rolling Machine, threading screw can tops. Approximately 35,000 pieces are turned out daily on this machine by this arrangement. "BLISS" Thread Rolling Machines are equipped to handle shells from ½-in. to 3-in. diameter.

BLISS 1857

E. W. Bliss Company

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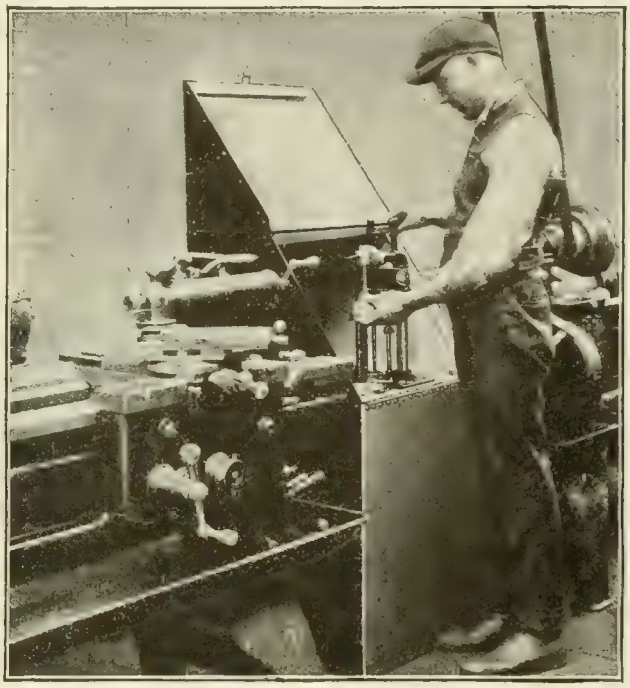
of Men and Machines



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There is no going back and forth to the oil room, no spilling, no wasted oil, no fire risk from the oil storage.

Save the Oil

The oil supply can be stored and handled as systematically as raw materials or finished parts—income checked, distribution measured, charged and recorded.

Write for literature, explaining why and how Bowser Systems pay for themselves, many times over in saving of oils and labor.

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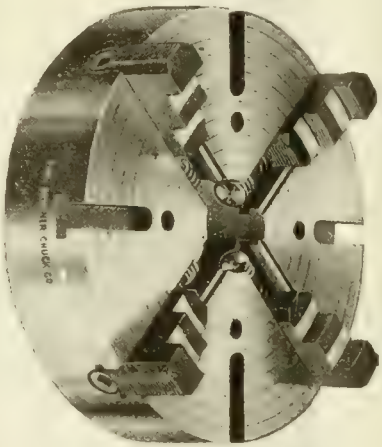
That truly describes Skinner Steel Body Independent Lathe Chucks. They are not only strong and powerful, but wonderfully accurate. The



4-Jaw Independent Chuck, Steel Body, for Heavy Duty

SKINNER Steel Body Independent Lathe Chuck

is a single steel casting of great strength, well proportioned and accurately finished. Face is graduated accurately in inches. Screws and bearings are made of the toughest steel to withstand abnormally hard wear.

The dependability of Skinner Steel Body Independent Lathe Chucks is conclusively proved by the fact that not one has ever been known to break in service—and we have been making them for many years.

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NEW BRITAIN, CONN U S A
ESTABLISHED 1887

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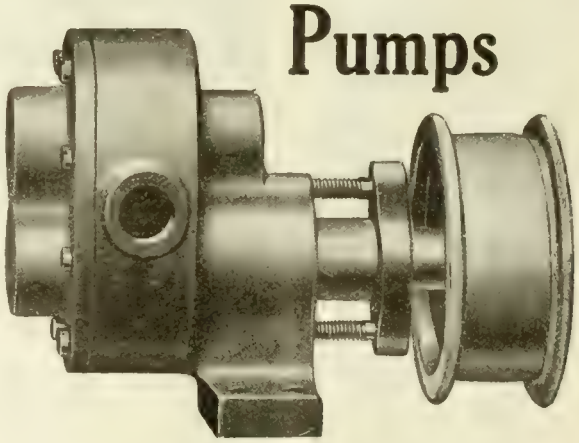
TRAHERN Circulating Pumps



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We guarantee that Trahern Rotary Geared Lubricating Pumps will not lose their prime when correctly installed. Also that they will deliver a much larger supply of coolant than a centrifugal pump operating at the same rate of speed. This low speed of Trahern Pumps means a more positive flow of lubricant and insures longer life.

Write for our Bulletin 44. It explains in detail.

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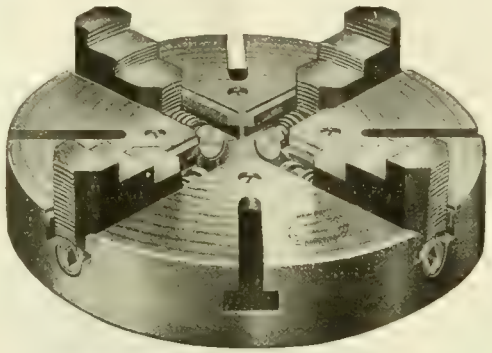
INDEPENDENT CHUCKS

are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

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Makers of a complete line of chucks

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Our aim is to have you become a satisfied customer

This is why we show such interest in supplying you with the brand of fire brick which will give the best service on your work.

Certain places produce certain conditions. No one brand of brick can meet all of them. We have a brand and burn designed to give the utmost satisfaction for each purpose.

Large stock of various shapes carried in warehouse at Hamilton.

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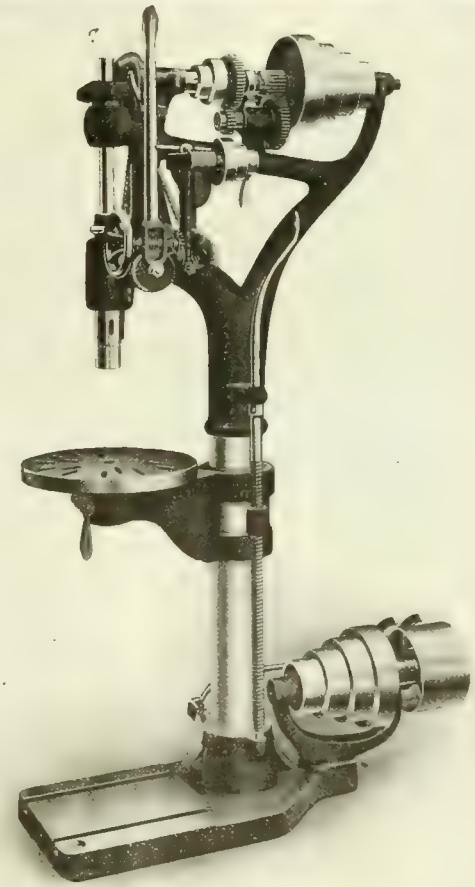

BUILT IN FOURTEEN SIZES

By the aid of a very efficient plant and organization, we manufacture these machines in large numbers by mass production.

Prices and Deliveries are Right

John M. Terry & Co.
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CABLES—ATHENIAN, SEDIST, LONDON

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NATCO NATCO

Drilling 285 Holes in Copper Rotor Rings Every Hour

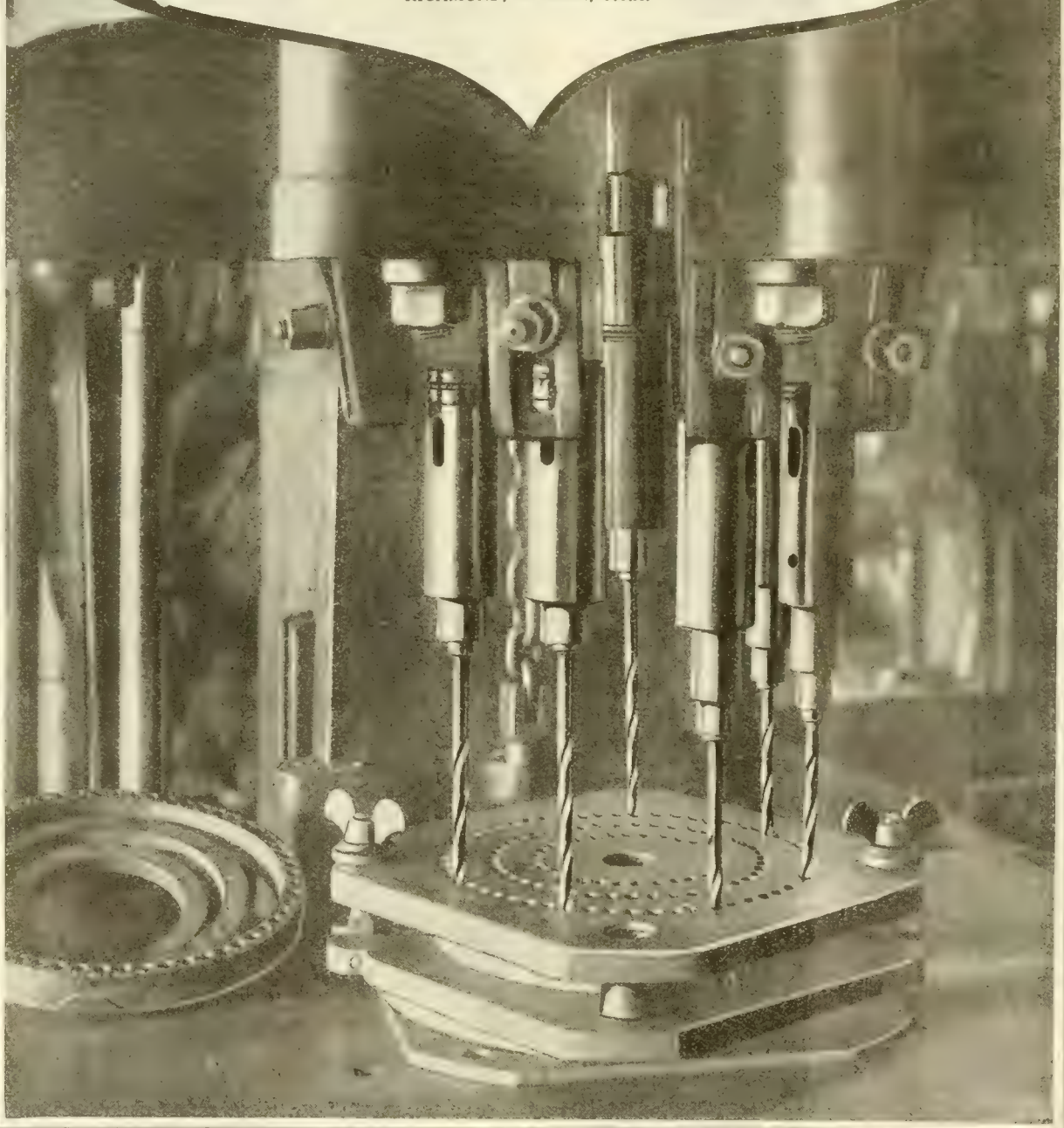
"A big time-saver," says the U.S. Electrical Mfg. Co. of Los Angeles. Fifty-seven 17 64 inch holes are drilled in each ring; five rings every hour.

This time-saving feature is used on NATCO Multi-Drillers exclusively. The speed of every spindle is independent of the speed of any other spindle and may be changed at the will of the operator to approximately the correct speed required for the size and type of tool being used. All spindles not in use are thrown into neutral, saving wear and power.

Manufacturers who have use for or are contemplating the installation of Multiple Spindle Drilling Machines should give careful consideration to our Independent Drill Speeds -a NATCO Patented Feature—One Nut Adjustable Spindle, and guaranteed Universal Joints, also exclusive features which make the NATCO the most economical Multi-Driller on the market.

THE NATIONAL AUTOMATIC TOOL COMPANY

Largest exclusive Manufacturers of Multi-Drillers and Multi-Tappers
RICHMOND, INDIANA, U.S.A.



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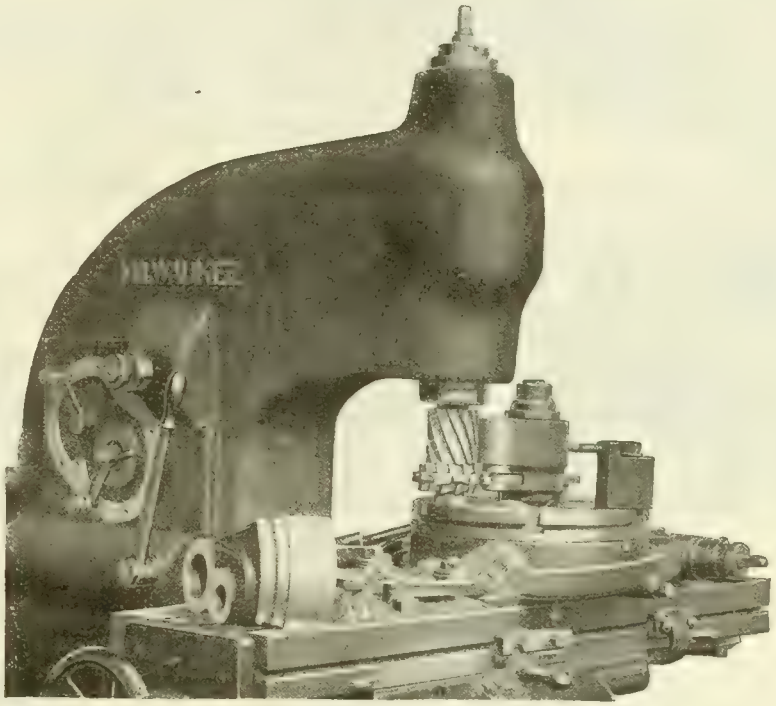
MILWAUKEE MILLING MACHINES



WHAT IS NECESSARY TO DO THIS JOB?

A good, rugged machine with abundant power

THE scientific construction of Milwaukee Vertical Milling Machines, with correct distribution of the metal to the column, knee, saddle and table, forms a harmonious unit. The spindle is non-adjustable except for wear, the knee alone being adjustable. This rigid construction gives these machines a degree of strength and power that enables them to efficiently handle the most difficult milling jobs.

The operation shown above is but one of the severe tests to which Milwaukee Milling Machines are constantly put. Four cutters, 2½″ wide x 3″ diameter, ½″ wide x 3⅝″ diameter, 7-16″ wide x 3⅝″ diameter, ⅝″ wide x 4⅝″ diameter remove ⅛″, 1-16″, 1-16″ stock and cut a slot ⅝″ deep out of solid metal, respectively. The length of each cut is 6″. The floor-to-floor rate for each piece is 5½ minutes. This work is done with the aid of the rotary table. In order to show the depth of the cuts, part of the casting has been milled and then the cutter was moved back to show this milled section. The balance of the segment is still in the rough.

Milwaukee Milling Machines possess exceptional ruggedness, abundant power and accuracy, making them capable of performing milling jobs of this kind with ease and rapidity. They assure milling satisfaction under all conditions.

Write for catalog—NOW.

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A new and large assortment of the finest diamonds for dressing emery wheels has been added to our stock. Canadian manufacturers will do well to let us know their requirements.

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Made by the Acid Electric process up to fifteen tons. Castings made by this process are free from blow holes, easy to machine, and superior in every way to ordinary Steel Castings.

Castings supplied for shipbuilding, cars, locomotives, all classes of machinery, etc.

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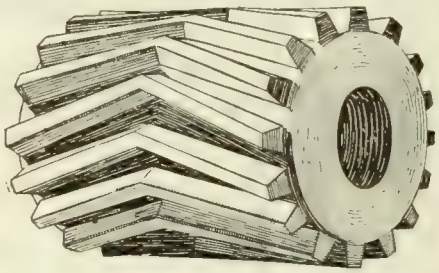

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We are prepared to give expert advice on the selection of tubing for various purposes. This service costs you nothing and may save you a lot of expense.

HEPBURN
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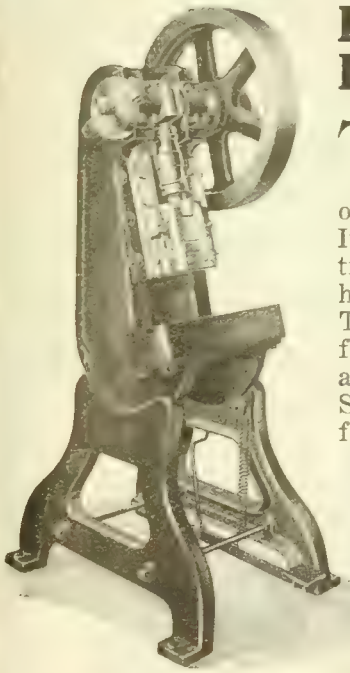

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High Carbon Steel
Manganese Steel
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QUALITY GUARANTEED

Sizes—½ lb. to 5,000 lbs. each

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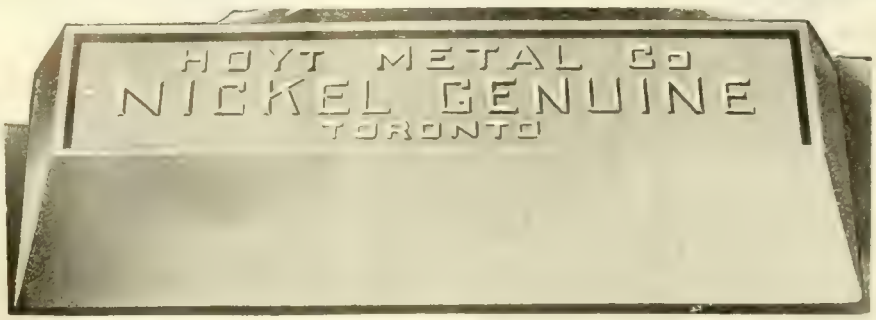

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HOYT METAL COMPANY
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Machines have much to do with the making of our files, but men have more.

The high technical efficiency of our operatives is largely responsible for the unvarying high quality.

For half a century we have been building up an organization of good men, jealous to maintain the reputation of these brands:

Kearney & Foot
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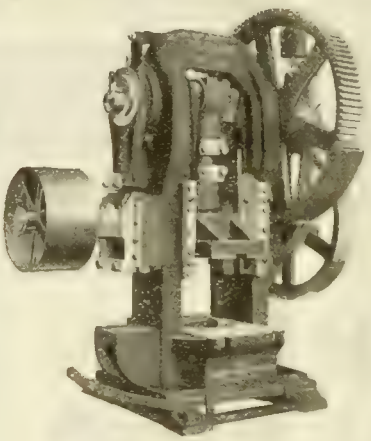
Straight Sided Presses



With or without outer trimming slide. Not only specially adapted to the severe usage of forge shops, but with exceptional capacity for the heavier classes of embossing, cutting, drawing, reducing, punching, piercing, shaping and stamping heavy blanks for an extensive variety of work. Complete range of sizes. Attractive deliveries.

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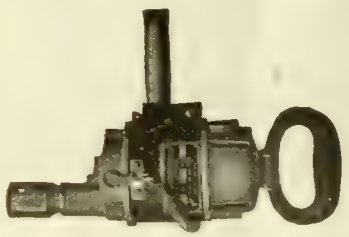
Save Time, Labor and Money



They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
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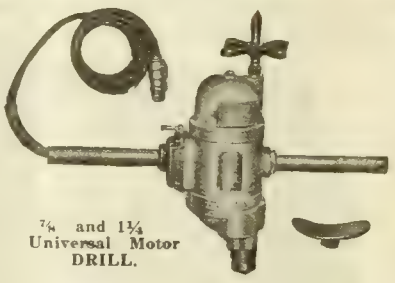
All motors wound for 110 or 220 volts

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅞ and 1¼ Universal Motor DRILL.

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THE UNITED STATES ELECTRICAL TOOL CO.

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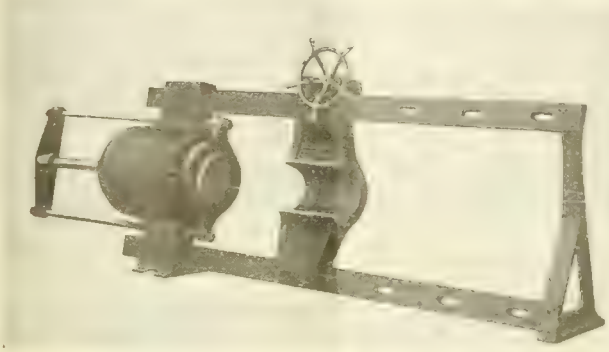

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400-Ton Hydraulic Wheel Press

This Made-in-Canada Press is built to operate direct from Accumulator at 1500 pounds per square inch pressure.

Perrin for Reliability

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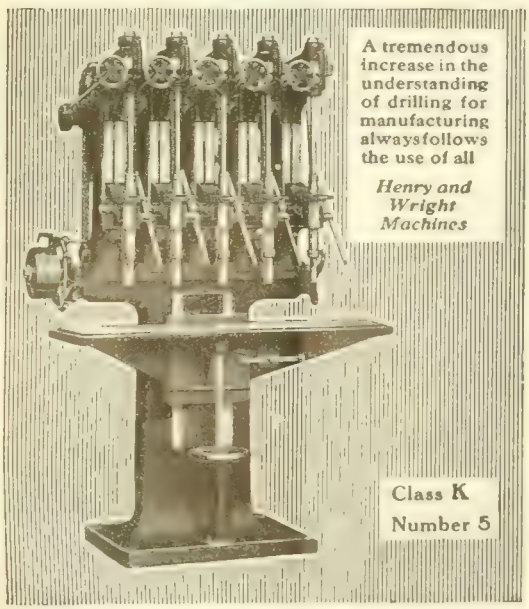
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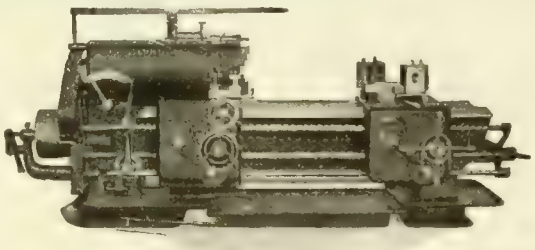

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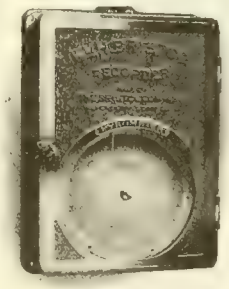

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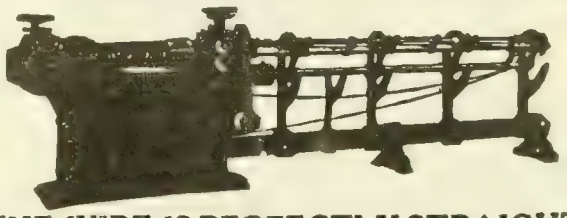

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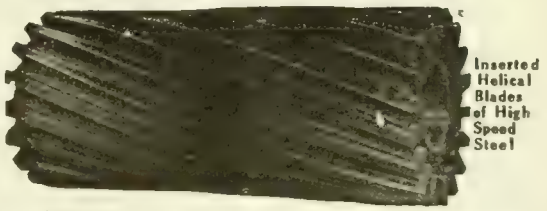

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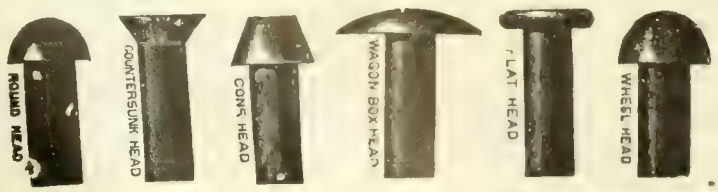

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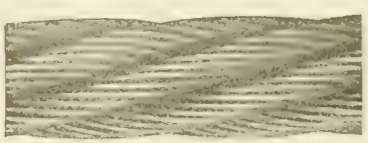

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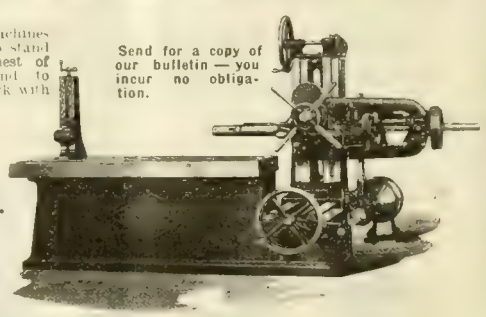

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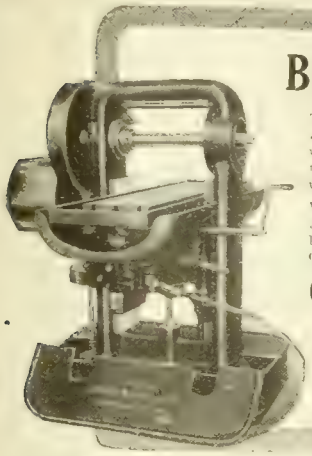

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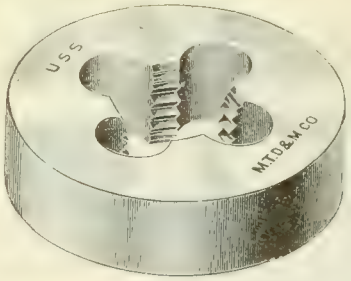

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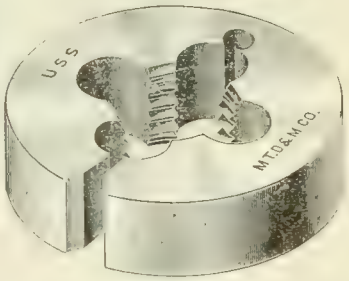

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"There is the greatest need for an end to extravagance, and for the exercise of the strictest economy in the administration of public affairs," says W. L. Mackenzie King in the January 15th issue of MACLEAN'S.

HE adds, further: "The first aim of the Liberal party in Canada to-day is to bring about such co-operation and co-ordination of effort among men and women of liberal aims"—(a small "l" please note)—"and aspirations as will ensure defeat of the combined forces of a reactionary Government, and make possible, in matters of Government, the re-assertion and ultimate triumph of liberal" — (still a small "l")—"principles and policies."

Is This a Message to Mr. Crerar?
Is This a Plea for Union of Farmers and Liberals?

Other Big Features in January 15th MACLEAN'S

There are fifteen other big feature articles, serials, short fiction and regular departments. These include:

"The Human Speedometer"
By Charles Christopher Jenkins.
The story of a Canadian who "times" race-horses as a profession.

"The Hat" By Frederick Niven.
A vivid word-picture of a feature of our West which strikes this war correspondent.

"My Flirtation Ends"
By Mrs. "Margot" Asquith.
Wife of former Premier of Great Britain tells how her eight years' dalliance with Peter ends.

"Our Lost Immigrants" By Miss Agnes C. Laut.
She tells some cold, hard facts, and explains why hundreds of thousands left Canada.

"Scarlet and Gold"
By Colonel George Ham.
Who gives here a few chapters from the romantic history of the Royal North West Mounted Police in earlier days.

"Paying the Doctor to Keep You Well"
By Ethel M. Chapman.
A worth-while and timely article, depicting the work of the Life Protective Association.

"A Canadian Child Poet"
A little bit about twelve-year-old Miss Rae Maltby Verrill, of British Columbia, whose work seems to show promising talent.

Interesting Fiction

"The Big Time Man"
By C. W. Stephens.
A bottling-business romance.

"The Act of God"
By Beatrice Heron-Maxwell.
A near-murderer's escape.

"Jane Ann's Rival, Mabel"
By Archie McKishnie.
A Lenix Ballister episode.

"The City of Peril"
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A romantic, Bolshevistic serial.

Review of Reviews

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"The Dreamer in the Kremlin." H. G. Wells.

"Chaplin Prey to 'Blues'." Benjamin de Casseres.

"Which Labor Policy?" Wm. B. Dickson.

"How Militarist is Japan?" Quarterly Review.

"Trapping an Elephant Herd." Charles Mayer.

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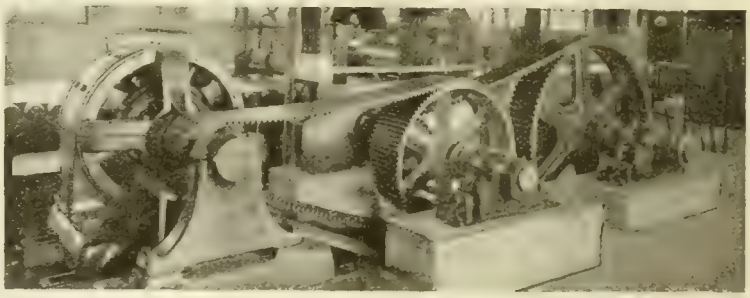

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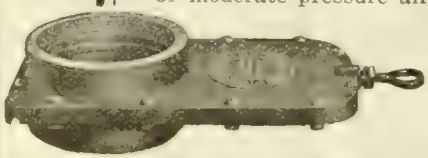

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Tallman Brass & Metal Co., Hamilton, Ont.

Bars, Steel
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Illingsworth Steel Co., John, New York City, N.Y.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Pilot Steel & Tool Co., Montreal, Que.
United Alloy Steel Corp., Canton, Ohio
Vanadium Alloys Steel Latrobe, Pa.
Wilkinson & Kompass, Hamilton, Ont.

Bearings, Ball
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

Bearings, Bronze
Tallman Brass & Metal Co., Hamilton, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

Bearings, Die-Cast
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Tallman Brass & Metal Co., Hamilton, Ont.

Bearings, Journal
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Bearings, Roller
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

Belt Cement
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

Belt Clamps
Graton & Knight Mfg. Co., Worcester, Mass.

Belt Dressings and Fillers
Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

Belt Fasteners
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Belt Lacing
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

Belt Lacing Machines
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

Belt Tools
Graton & Knight Mfg. Co., Worcester, Mass.

Belting, Chain
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ithaca, N.Y.
Rubber Belting of Canada, Ltd., Montreal, Que.

Belting, Fabric
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Ford Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City.

Belting, Leather
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Montreal, Que.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Stuart Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot.

Belting, Rubber
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

Belts, Abrasive
Carborundum Co., Niagara Falls, N.Y.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

Bench Countershaft Standards
Fisher Steel Machine Co., Hamilton, Ont.

Benches, Work
Aikenhead Hardware Ltd., Toronto, Ont.

Bending Machines, Power
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pedrick & Ayer Inc. T., Chicago, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

Bins, Ore
MacKinnon Steel Co., Sherbrooke, Que.

Blocks
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

Blocks, Chain (See Hoists, Hand)
Aikenhead Hardware Ltd., Toronto, Ont.
Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

Blocks, Die
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Illingsworth Steel Co., John, New York City, N.Y.

Blocks, Pillow
Can. Link-Belt Co., Toronto, Ont.

Blowers
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies Ltd., Montreal, Que.
Sturtevant Co., B. F., Boston, Mass.

Bolt and Nut Machinery
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio
Victor Tool Co., Waynesboro, Pa.

Bolt and Nut Machinery, Automatic
National Acme Co., Cleveland, Ohio.

Bolts and Nuts
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.

Bolt Threading Die Heads
Landis & Lingard Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

Boosters
Sturtevant Co., B. F., Boston, Mass.

Boring and Turning Mills, Vertical
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

Boring, Drilling and Milling Machines, Horizontal
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
James Tool Co., Warren, Pa.
Universal Boring Machine Co., Hudson, Mass.

Boring, Drilling and Milling Mach., Vertical
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Boring Heads
Aikenhead Hardware Ltd., Toronto, Ont.

Boring Tools
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

Brakes, Magnetic (for electric furnaces)
Volta Mfg. Co., Welland, Ont.

Brass
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Bricks, Fire
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

Bridges
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

Broaching Machines
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.

Bronze
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Bronze, Phosphor
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton Ont.

Bucket Carriers, Pivoted
Can. Link-Belt Co., Toronto, Ont.

Buffing or Polishing Machines (See Polishing and Buffing Machines)
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

Bulldozers
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

Burners, Oil and Gas
Can. Hanek Burner Co., Port Hope, Ont.
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

Bushings
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Calipers
Brown & Sharpe Mfg. Co., Providence, R.I.
Goodell & Pratt Co., Greenfield, Mass.
Starrett Co., L. S., Athol, Mass.

Cams
Canada Foundries & Forgings Co., Welland, Ont.

Can-Making Machinery (See Sheet Metal Working Machinery
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

Cars, Ore
MacKinnon Steel Co., Sherbrooke, Que.

Castings, Aluminum
Canada Foundries & Forgings Co., Welland, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

BUYERS' DIRECTORY

Castings, Brass and Bronze
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont
Electric Steel & Engineering Co., Welland, Ont.
International Machinery & Supply Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Copper
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Marine
Can. Steel Foundries, Montreal, Que

Castings, Die Molded
Electric Steel & Engineering Co., Welland, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal Ltd. Hamilton, Ont.

astings, Ferro-Alloy
Can. Steel Foundries, Montreal, Que.

astings, Iron
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia
Electric Steel & Engineering Co., Welland, Ont.
Fleck Ltd., Alexander, Ottawa, Ont.
Hanna & Co., M. A., Cleveland, Ohio
Hepburn Ltd., John T., Toronto, Ont
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Castings, Hyd. Press
Can. Steel Foundries, Montreal, Que

Castings, Monel Metal
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

Castings, Naval Bronze
Tallman Brass & Metal Ltd. Hamilton, Ont

Castings, Nichrome
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que
Katie Foundry Co., Galt, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont

Castings, Nickel
Can. Hanson & Van Winkle Co., Toronto, Ont.

Castings, Semi-Steel
Davidson Mfg. Co., Thos., Montreal, Que
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries Ltd., Winnipeg, Man.

astings, Steel
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont

Cements, Iron
Smooth Mfg. Co., Jersey City, N.J

Centering Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock Walker Mchy. Co., Toronto, Ont.

Chains (See Sprockets and Chains)
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio

Chains, Driving
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio

Chasers
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chemists
Toronto Testing Laboratory, Toronto, Ont.

Chucking Machines
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Chucks, Drill
Jacobs Mfg. Co., Hartford, Conn

Chucks, Drill and Tap
Aikenhead Hardware Ltd., Toronto, Ont
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont
Goodell & Pratt Co., Greenfield, Mass
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que

Chucks, Lathe
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que

Chucks, Magnetic
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chucks, Planer
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn
Union Mfg. Co., New Britain, Conn

Chucks, Vertical Boring Mill
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn

Clamps, Machinists'
Columbia Hdwe. Division, Cleveland, O
Dickow, Fred C., Chicago, Ill
Starrett Co., L. S., Athol, Mass.

Cleaners, Metal, Waste, General
Oakley Chemical Co., New York, N.Y.

Clocks, Time
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Clutches, Friction
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

Coal and Ash Handling Machinery
Can. Ingersoll Rand Co., Ltd., Sherbrooke Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Coal-Storage Systems
Can. Link-Belt Co., Toronto, Ont

Collars, Shaft or Set
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

Collets
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Compounds, Carburizing, Case Hardening and Tempering
Cataract Refining Co., Toronto, Ont.

Compounds, Cleaning
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont
Oakley Chemical Co., New York, N.Y.

Compounds, Cutting, Drilling, Grinding, Screw Cutting
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Compressors, Air
Curtis Pneumatic Machinery Co., St. Louis, Mo.

Compressors, Air and Gas
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

Cones, Friction
Norton Co. of Can., Ltd., Hamilton, Ont.

Connecting Rods and Straps
Canada Foundries & Forgings Co., Welland, Ont.

Contract Work
Ford-Smith Machine Co., Hamilton, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.

Conveyors and Elevators (See Elevators)
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

Copper
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Cored Bronze Bars
Tallman Brass & Metal Ltd., Hamilton Ont

Cotter Pins
Morrow Screw & Nut Co. Ltd., John, Ingersoll, Ont.

Counterbores
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Counters, Revolution.
Aikenhead Hardware Ltd., Toronto, Ont
Starrett Co., L. S., Athol, Mass.

Countershafts
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

Countersinks
Butterfield & Co., Inc., Rock Island, Que
Eclipse Counterbore Co., Ltd., Walkerville, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Couplers, Car and Locomotive
Can. Steel Foundries, Montreal, Que

Couplings, Flexible
Holden Co., Ltd., Montreal, Que.

Couplings, Rigid
Bernard Industrial Co., A., Fortierville, Que.

Couplings, Shaft
Bilton Machine Co., Bridgeport, Conn
Can. Link-Belt Co., Toronto, Ont.

Cranes, Electric
Bertram & Son Co., Ltd., The John, Dundas, Ont
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont
Northern Crane Works, Walkerville, Ont

Cranes, Hand (See Hoists, Hand)
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Sheffield Engineering Supplies, Ltd., Montreal, Que.

Cranes, Locomotive
Can. Link-Belt Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que

Cranes, Traveling
Bertram & Son Co., Ltd., The John, Dundas, Ont
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont

Crank Pin Turning Machines
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

Cutters, Flue
Holden Co., Ltd., Montreal, Que

Cutters, Gear
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, High Speed
Atkins & Co., Inc., E. C., Indianapolis, I
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

Cutters, Milling
Bilton Machine Co., Bridgeport, Conn
Brown & Sharpe Mfg. Co., Providence R.I
Butterfield & Co., Inc., Rock Island, Que
Cleveland Milling Machine Co., Cleveland.
Elliott & Whitehall Tool Co., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Cutters, Stay Bolt
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, Thread
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa

Cutting-Off Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)
Landis Machine Co., Inc., Waynesboro, Pa
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Cutting-Off Tools
Armstrong Bros. Tool Co., Chicago, Ill
Pilot Steel & Tool Co., Montreal, Que

Cutting Oil Filters (See Oil Filtering Systems)
Bowser & Co., Inc., S. F., Fort Wayne I
Cataract Refining Co., Toronto, Ont.

Cutting, Oxy-Acetylene
Carter Welding Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Perdue W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont

Dealers, Machinery (See Searchlight Section)
Ford-Smith Machine Co., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont

Deckle Straps
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Diamonds, Black and Rough
Joyce-Koebel Co., Inc., New York, N.Y

Diamond, Carbon and Bortz
Joyce-Koebel Co., Inc., New York, N.Y

Diamond Tools
Aikenhead Hardware Ltd., Toronto, Ont
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Wheel Trueing Tool Co., Detroit, Mich.

Diamond Crossings
Can. Steel Foundries, Montreal, Que

Die-Castings
Tallman Brass & Metal, Ltd., Hamilton, Ont

Die Sinking Machines, Automatic
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

Die Sinkers
Kimber & Hillier, St. Catharines, Ont

Dies, Screw and Thread Cutting
Ackworthie, Ltd., John, Birmingham, Eng
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

Dies, Sheet-Metal and Sub-Press (See Tool Work)
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Toledo Machine & Tool Co., Toledo, Ohio

Dies, Forging
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

Dies, Hammer
Kimber & Hillier, St. Catharines, Ont

BUYERS' DIRECTORY

Dies, Self-Opening, Adjustable
Geometric Tool Co., New Haven, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Dies, Threading-Opening
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que

Disc Cement
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill

Dividing Heads
Ackworthe, Ltd., John, Birmingham, Eng
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont.

Dogs, Lathe and Milling Machine
Armstrong Bros. Tool Co., Chicago Ill

Drafting Boards and Tables
Darling Bros. Ltd., Montreal, Que
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que

Drafting Materials
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que

Dressers, Grinding Wheel
Carborundum Co., Niagara Falls, N.Y
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.

Drill Holders
Armstrong Bros. Tool Co., Chicago, Ill

Drill Rods
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Drill Speeders
Canada Machinery Corp., Galt, Ont.

Drilling Machine Heads
Henry & Wright Mfg Co., Hartford, Conn
Hoefer Mfg Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

Drilling Machines, Automatic
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond Ind.

Drilling Machines, Bench
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Goodell & Pratt Co., Greenfield, Mass.
Henry & Wright Mfg. Co., Hartford, Conn.
High Speed Hammer Co., Rochester, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Electric and Hand
Aikenhead Hardware Ltd., Toronto, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Gang
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Drilling Machines, Heavy Duty
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind
Rockford Lathe & Drill Co., Rockford Ill.

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)
Canada Machinery Corp., Galt, Ont
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford Ill.

Drilling Machines, Multiple Spindle
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg Co., Freeport, Ill
National Acme Co., Cleveland, Ohio
National Automatic Tool Co., Richmond Ind
Terry & Co., John C., Birmingham, Eng.

Drilling Machines, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool, Chicago, Ill.

Drilling Machines, Portable
Haskins Co., R. G., Chicago, Ill.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Radial
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rietson & Son, Jos. T., Chicago, Ill
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal Que

Drilling Machines, Sensitive
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
High Speed Hammer Co., Rochester, N.Y.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont
Wisconsin Electric Co., Racine, Wis

Drilling Machines, Turret
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

Drilling Machines, Vertical
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
Medland & Jones Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford Ill
Perfect Machine Co., Ltd., Galt, Ont
Terry & Co., John C., Birmingham, Eng.
Tool Co. of Can., Ltd., Chas. A., Windsor, Ont.

Drills, Center
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
Medland & Jones Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford Ill
Perfect Machine Co., Ltd., Galt, Ont
Terry & Co., John C., Birmingham, Eng.
Tool Co. of Can., Ltd., Chas. A., Windsor, Ont.

Drills, Center
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Cleveland Twist Drill Co., Cleveland, O
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada Ltd Dundas, Ont
Wilt Twist Drill Co. of Canada, Ltd Walkerville, Ont.

Drills, High Speed Twist
Armstrong Whitworth, Co. of Can., Ltd Montreal, Que.
Butterfield & Co., Inc. Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co. Walkerville Ont.
Foss Machinery & Supply Co., Geo. F. Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd Montreal, Que.
Sheffield Twist Drill & Steel Co. Sheffield, Eng.
Taylor Tool Co., J. A. M., Toronto, Ont.
Wilt Twist Drill Co. of Canada Ltd Walkerville, Ont.

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc. Rock Island Que
Cleveland Twist Drill Co., Cleveland, O
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Drills, Twist and Flat
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada Ltd Walkerville, Ont.

Dust Handling Equipment
Can. Blower & Forge Co., Ltd. Kitchener.
Sturtevant Co., B. F., Boston, Mass.

Electrical Instruments
Bristol Co., Waterbury, Conn
Northern Electric Co., Montreal, Que.

Electrical Supplies
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O

Elevating Trucks (See Trucks)
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Elevators and Conveyors
Can. Link Belt Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

Emery Cloth
Wausau Abrasives Co., Chicago, Ill.

Emery Wheels (See Grinding Wheels)
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

Engines, Capstan
Kennedy & Sons, Wm., Owen Sound, Ont

Engineers, Mechanical
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif

Expanders, Tube
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie Ltd., H. W., Toronto Ont

Eyeglasses, Safety (See Goggles, Safety)
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

Fans, Electric
Can. Blower & Forge Co., Ltd., Kitchener
Northern Electric Co., Montreal, Que
Sturtevant Co., B. F., Boston, Mass

Fans, Exhaust
Can. Blower & Forge Co., Ltd., Kitchener
Petrie Ltd., H. W., Toronto, Ont
Sturtevant Co., B. F., Boston, Mass

Fans, Ventilating
Can. Blower & Forge Co., Ltd. Kitchener
Can. Ingersoll Rand Co., Ltd. Sherbrooke Que
Petrie Ltd., H. W., Toronto, Ont
Sturtevant Co., B. F., Boston, Mass

Fibre
Diamond State Fibre Co., Toronto, Ont
Northern Electric Co., Montreal, Que

File Handles
Ingersoll File Co., Ltd. Ingersoll Ont

Files and Rasps
Atkins & Co., Inc., E. C., Indianapolis, I
Foss Machinery & Supply Co., Geo. F. Montreal, Que.
Ingersoll File Co., Ltd. Ingersoll, Ont
International Machinery & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont
Simonds Canada Saw Co., Montreal Que

Filing Machines
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Filler, Iron (See Cements, Iron)
Smooth Mfg Co., Jersey City, N.J

Fire Extinguishers
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Fittings, Pipe
International Malleable Iron Co., Guelph, Ont.

Flexible Shafts
Aikenhead Hardware Ltd., Toronto, Ont.
Haskins Co., R. G., Chicago, Ill.

Flux, Galvanizing
British Smelting & Refining Co., Ltd., Montreal, Que.

Fluxes, Welding
L'Air Liquide Society, Toronto, Ont

Forging Machinery
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot

Forgings, Drop
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co. Ltd Toronto, Ont.

Forgings, Hammer
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont
N. S. Steel Co., Ltd., New Glasgow, N.S.

Foundry Equipment
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., E., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont
Rice Lewis & Son, Ltd., Toronto, Ont.

Foundry Supplies
Atkins & Co., Inc., E. C., Indianapolis I
Rice Lewis & Son, Ltd., Toronto, Ont
Sturtevant Co., B. F., Boston, Mass

Frogs, Spring or Rigid
Can. Steel Foundries, Montreal, Que

Fuel Oil Burning System
General Combustion Co. of Can., Ltd., Montreal, Que

Furnaces, Electric
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

Furnaces, Heat Treating Coal
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City

Furnaces, Heat Treating Oil and Gas
Bellevue Industrial Furnace Co., Detroit
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furnaces and Ovens, Electric
Electric Furnace Construction Co., Philadelphia, Pa
Petrie Ltd., H. W., Toronto, Ont
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furnaces, Tempering and Annealing
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont

Furniture, Machine Shop
Garlock-Walker Mchy. Co., Toronto, Ont
Ministry of Munitions, London, Eng.
National Engineering Co., Sarnia, Ont

Gages, Dial
Herbert Ltd., Alfred, Toronto, Ont.
Johansson, Inc., C. E., Windsor, Ont
Perdue, W. B., San Francisco, Calif
Starrett Co., L. S., Athol, Mass

Gages, Measuring (See Tool Work)
Crescent & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q
Greenfield Tap & Die Corp., Galt, Ont.
Johansson, Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass

Gages, Recording
Bristol Co., Waterbury, Conn.
Johansson, Inc., C. E., Windsor, Ont

BUYERS' DIRECTORY

Gages, Snap, Thread and Cylindrical
Ackworthne Ltd John Birmingham, Eng
Brown & Sharpe Mfg Co Providence R I
Greenfield Tap & Die Corp., Galt, Ont.
Johansson, Inc., C E., Windsor Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Gages, Special Measuring (See Tool Work)
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Gages, Standard
Armstrong Whitworth Co. of Can., Lt Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis,
Elliott & Whitehall Tool Co., Galt, O
Johansson Inc., C E., Windsor, Ont

Gages, Thread
Ackworthie, Ltd., John, Birmingham, Eng
Greenfield Tap & Die Corp., Galt, Ont
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass

Garnet, Emery and Flint Paper and Cloth
Ritchey Supply Co., Toronto, Ont
Wausau Abrasives Co., Chicago, Ill

Gas, Coal Compressed
L Air Liquide Society, Toronto, Ont

Gas, Compressed
Prest-O-Lite Co. of Can., Toronto, Ont.

Gaskets
Diamond State Fibre Co of Can., Ltd Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J

Gear Blanks
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co of Can., Ltd Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Philadelphia Gear Works, Philadelphia, Pa

Gear-Cutting Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I
Fellows Gear Shaper Co., Springfield, Vt
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D E., New London Conn.

Gear Testing Machines
Brown & Sharpe Mfg. Co., Providence, R I

Gears, Cast
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que

Gears, Cut
Brown & Sharpe Mfg. Co., Providence, R.I
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q
Diamond State Fibre Co., Toronto, Ont
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Gardner & Son, Robt., Montreal, Que
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Gears, Dressed
Kennedy & Sons, Wm., Owen Sound, Ont.

Gears, Forged
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

Gears, Herringbone
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

Gears, Machine Moulded
Can. Steel Foundries Montreal, Que

Gears, Rawhide (See Gears, Cut)
Philadelphia Gear Works, Philadelphia, Pa.

Gear, Silent Chain
Gardner & Son, Robt., Montreal, Que
Morse Chain Co., Ithaca, N.Y.

Gears, Worm
Dom. Steel Products Co., Brantford, Ont.

Generators, Acetylene
L'Air Liquide Society, Toronto, Ont.

Generators, Electric
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Goggles, Safety
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa

Grab Buckets
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Grease Cups, Pressed Steel and Brass
Can. Winkley Co., Ltd., Windsor, Ont.

Greases, Lubricating
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

Grinding Discs
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

Grinding Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Grinding Machines, Abrasive Belt
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Automatic
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Bench
Aikenhead Hardware Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Goodell & Pratt Co., Greenfield, Mass
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.
Terry & Co., John C., Birmingham, Eng
Stellinger Co of Can., Ltd., Chas A Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R Montreal, Que.

Grinding Machines, Center
U S Electrical Tool Co Cincinnati O
Wisconsin Electric Co., Racine Wis

Grinding Machines Chaser

Grinding Machines, Cutter and Reamer
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Cylindrical
Garlock Walker Mchy Co Toronto, Ont
Greenfield Machine Co., Greenfield, Mass
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Die
Jones & Lamson Machine Co., Springfield Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

Grinding Machines, Disc
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Drill
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que

Grinding Machines, Face
Ford Smith Machine Co., Hamilton, Ont

Grinding Machines, Floor and Tool
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.
Wilkinson & Kompass, Hamilton, Ont.

Grinding Machines, Internal
Garlock-Walker Mchy Co., Totonto, Ont
Holden Co., Ltd., Montreal, Que.
Manhattan Machine & Tool Works, Grand Rapids, Mich.

Grinding Machines, Portable
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Carborundum Co., Niagara Falls, N.Y.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto Ont.
Garlock-Walker Mchy. Co., Toronto Ont
Haskins Co., R. G., Chicago, Ill
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Wilkinson & Kompass, Hamilton, Ont
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Power Oscillating Tool
Herbert Ltd., Alfred, Toronto, Ont.

Grinding Machines, Ring Wheel
Ford-Smith Machine Co., Hamilton, Ont

Grinding Machines, Snagging
Norton Co of Can., Ltd., Hamilton, Ont

Grinding Machines, Surface
Garlock Walker Mchy Co., Toronto, Ont
La Salle Tool Co., Ltd., La Salle, Ill
Petrie Ltd., H W., Toronto, Ont
Pratt & Whitney Co., of Canada, Ltd Dundas Ont.

Grinding Machines, Thread
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

Grinding Machinery, Tool Post
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wilkinson & Kompass, Hamilton, Ont
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Universal
Foss Machinery & Supply Co, Geo F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Gisholt Machine Co., Madison, Wis.
Greenfield Machine Co., Greenfield, Mass
La Salle Tool Co., Ltd., La Salle, Ill
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Modern Tool Co., Erie Pa
Morse Twist Drill & Machine Co., New Bedford, Mass
Petrie Ltd., H. W., Toronto, Ont
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.

Grinding Wheels
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I
Carborundum Co., Niagara Falls, N.Y
Dom. Abrasive Wheel Co., Ltd., Mimico Ont.
Ford-Smith, Machine Co., Hamilton, Ont
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

Guards, Machinery and Window
Can Wire & Iron Goods Co., Hamilton, Ont.

Gun-Barrel Machinery
Stemle Turret Machine Co., Madison, Wis

Hack Saws, Power
Ackworthie, Ltd., John, Birmingham, Eng
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I
Garlock-Walker Mchy. Co., Toronto, Ont
Goodell & Pratt Co., Greenfield, Mass
Lyman Tube & Supply Co., Montreal, Que
McKenzie Machinery Co., Guelph, Ont
Petrie Ltd H W., Toronto, Ont
Simonds Canada Saw Co., Montreal, Que
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R Montreal, Que.

Hammers, Chipping
Cleveland Pneumatic Tool Co., Toronto Ont.

Hammers, Drop
Bertram & Son Co., Ltd., The John Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

Hammers, Electric
Aikenhead Hardware Ltd., Toronto, Ont
Brown, Boggs & Co., Ltd., Hamilton, Ont
Holden Co., Ltd., Montreal, Que.

Hammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Keller Pneumatic Tool Co., Grand Haven, Mich
Ryerson & Son, Jos T., Chicago, Ill

Hammers, Power
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bradley & Son, Inc., C. C., Syracuse, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos T., Chicago, Ill.

Hammers, Rivetting
Cleveland Pneumatic Tool Co., Toronto, Ont.
Ryerson & Son, Jos T., Chicago Ill

Hangers, Shafting
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co Toronto Ont.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que

Hardening, Case-Hardening and Tempering
Hamilton Gear & Machine Co., Toronto, Ont.

Hardness Testing Apparatus
Shore Instrument Co., Jamaica, N.Y

Hobbing Machines
Herbert Ltd., Alfred, Toronto, Ont.
Petrie Ltd. H W., Toronto, Ont

Hobs
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

Hoists, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Volta Mfg Co., Welland, Ont.

Hoists, Hand
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio

Hoists, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

Holders-On, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Hose, All Kinds
Quaker City Rubber Co., Philadelphia, Pa.

Hose, Flexible
Gutta Percha & Rubber, Toronto, Ont.

Hose, Industrial
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.

Hose, Rubber
Can Consolidated Rubber Co., Ltd., Montreal, Que.
Can Foamite Firefoam Co., Hamilton, Ont.

Hose, Steam, Suction, Water
Quaker City Rubber Co., Philadelphia, Pa.

Hose, Steel
International Machinery & Supply Co., Montreal, Que.

Hydraulic Leather
Graton & Knight Mfg. Co., Worcester, Mass.

Hydraulic Machinery
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy Co., Toronto, Ont
Stewart & Co., Duncan, Glasgow Scot

Index Centers
Dickow, Fred C., Machinery Co., Chicago, Ill

Igniters, Gas Engine
Canada Foundries & Forgings Co., Welland, Ont.

Indicators, Speed and Test
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

Insultion
Diamond State Fibre Co of Can., Ltd Toronto, Ont.

Jacks, Hydraulic
International Machinery & Supply Co., Montreal, Que.
Norton, A. O., Boston, Mass.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago, Ill
Starrett Co., L. S., Athol, Mass.

Jigs and Fixtures (See Tool Work)
Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.

Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

Keyseating Machines
Bilton Machine Co., Bridgeport, Conn.
Elliott & Whitehall Tool Co., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Toomey Inc., Frank, Philadelphia, Pa.

Keys, Machine
Can. Drawn Steel Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont
Morton Mfg. Co., Muskegon, Mich.

Knives, Machine
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Simonds Canada Saw Co., Montreal, Que.

Knurl Holders
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Lacing Leather
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que

Lamps, Electric
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que

Lathe Attachments
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

Lathe Pans, Portable
Canada Machinery Corp., Galt, Ont.

Lathe Tools
Armstrong Bros. Tool Co., Chicago, Ill
Can. Atlas Crucible Stee. Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

Lathes, Automatic and Semi-Automatic
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Bench
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Lathes, Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)
Acme Machine Tool Co., Cincinnati, Ohio
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield Vermont.
McDougall Co., Ltd., R., Galt, Ont.
McKenzie Machinery Co., Guelph, Ont
Ryerson & Son, Jos. T., Chicago, Ill.
Steinle Turret Machine Co., Madison, Wis
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Engine
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo
McDougall Co., Ltd., R., Galt, Ont.
Ministry of Munitions, London, Eng.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill
Roelefson Machine & Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Extension and Gap
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Lathes, Heavy Duty Projectile Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blashill Wire Machy. Co., Ltd., Montreal

BUYERS' DIRECTORY

Sidney Machine Tool Co., Sidney, Ohio
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Horizontal Turret
Acme Machine Tool Co., Cincinnati, Ohio
Bluell Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich
Petrie, Ltd., H. W., Toronto, Ont
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Polishing (See Polishing and Buffing Machines)
Ford Smith Machine Co., Hamilton, Ont

Lathes, Relieving
Canada Machinery Corp., Galt, Ont
Hendey Machine Co., Torrington, Conn
McDougall Co., Ltd., R., Galt, Ont

Lathe, Universal Hand
Brown & Sharpe Mfg. Co., Providence, R.I

Lathe, Speed and Hand
Garlock Walker Mchy. Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont.

Lathes, Spinning
Terry & Co., John C., Birmingham, Eng.

Lathes, Threading
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

Lathes, Vertical Turret
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont
Roelefson Machine & Tool Co., Toronto, Ont.

Lathes, Wood Turning
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Lighting Fixtures
Northern Electric Co., Montreal, Que
Taylor Brass & Metal Co., Hamilton, Ont.

Linoleum Mill Machinery
Barclays Ltd., Edinburgh, Scotland

Liquid Air Plants
L'Air Liquide Society, Toronto, Ont.

Lockers, Clothes
Can. Locker Products Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

Lubricants
Cateract Refining Co., Toronto, Ont.
Vacuum Oil Co., New York, N.Y.

Lubricating Systems
Bowser & Co., Inc., S. F., Fort Wayne, I.

Machinists' Small Tools
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Goodell & Pratt Co., Greenfield, Mass
Ker & Goodwin Machine Co., Brantford, Ont.
Mackey & Mackenzie, London, Eng.
New Haven Machine Tool Co., Racine, Wis
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que
Ridout & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Ryerson & Son, Jos. T., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Manganese Steel
Canada Foundries & Forgings, Montreal, Que.

Mandrels, Expanding
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Mandrels, Solid
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Measuring Machines
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Metals, Alloy
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Metalite Cloth
Ritchey Supply Co., Toronto, Ont.

Micrometer Calipers
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

Milling Attachments
Ackworthie, Ltd., John, Birmingham, Eng
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont

Milling Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Milling Machines, Automatic
Bilton Machine Co., Bridgeport, Conn
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Bench
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Hand
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

Milling Machines, Horizontal and Planer Type
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

Milling Machines, Plain
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
Toomey Inc., Frank, Philadelphia, Pa

Milling Machines, Thread
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Milling Machines, Universal
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toomey Inc., Frank, Philadelphia, Pa
Williams Machinery & Supply Co., A. R., Montreal, Que.

Milling Machines, Vertical
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

Monel Metal
International Nickel Co. of Can., Ltd., Toronto, Ont.

Motors, Electric
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

Moulded Rubber Goods
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Nickel, Bars, Sheets, Wire, Etc.
International Nickel Co. of Can., Ltd., Toronto, Ont.

Nickel Plating Outfits
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Nickel Silver
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Nitrogen
L'Air Liquide Society, Toronto, Ont.

Nut Tappers (See Bolt and Nut Machinery)
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John Dundas, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

Nuts, Finished and Semi-finished
Galt Machine Screw Co., Galt, Ont.

Nuts, S.A.E., Plain and Castellated
Galt Machine Screw Co., Galt, Ont.

Oil Filtering and Storage Systems
Bowser & Co., Inc., S. F., Fort Wayne, I.

Oil Storage Engineers
Bowser & Co., Inc., S. F., Fort Wayne, I.

Oils
Canadian Oil Companies, Ltd., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oil Hole Covers
Can. Winkley Co., Ltd., Windsor, Ont.

Oils, Soluble
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont

Oil Stones
Carborundum Co., Niagara Falls, N.Y.

Oxygen
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont

Oxy-Acetylene Apparatus
L'Air Liquide Society, Toronto, Ont.

Packing, Hydraulic
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass
Guildford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont.
International Machinery & Supply Co., Montreal, Que.

Packing, Rod and Steam
Quaker City Rubber Co., Philadelphia, Pa.

Packing, Steam
Can. Consolidated Rubber Co., Ltd., Montreal, Que
Graton & Knight Mfg. Co., Worcester, Mass
Guildford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont.
International Machinery & Supply Co., Montreal, Que.

Paper Mill Conveyors
Bertram & Son, Ltd., Dundas, Ont.

Patents
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que

Pans, Wet and Dry
Pratt Mfg. Co., Cleveland, O.

Pattern-Shop Machinery (See Woodworking Machinery)
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Patterns, Wood and Metal
Canada Machinery Corp., Galt, Ont.
Montreal Pattern Works, Montreal, Que.
Valentine & Co., Ottawa, Ont.
Wilson Pattern Works, Galt, Ont.

Penstocks, Steel
MacKinnon Steel Co., Sherbrooke, Que

BUYERS' DIRECTORY

Phosphor Tin
British Smelting & Refining Co., Ltd., Montreal, Que

Photographic Duplicating Machines
Commercial Camera Co., Providence, R.I.

Pipe Bending Machines
American Pipe Bending Machine Co., Boston, Mass
Underwood Corp., H. B., Philadelphia, Pa
Williams Machinery Co., A. R., Toronto, Ont

Pipe Cutting and Threading Machines
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Pipe and Nipple Threading Machines
Landis Machine Co., Inc., Waynesboro, Pa.

Pipe Fitters' Tools
Alkenhead Hardware Ltd., Toronto, Ont
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Pipe Threading Die Heads
Landis Machine Co., Inc., Waynesboro, Pa

Piston-Ring Machines
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Planers, Parallels
L. & P. Mfg. Co., Niagara Falls, Ont

Planing Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

Planing Machines, Rotary
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

Plate Rolls
Bertram & Son Co., Ltd., The John, Dundas, Ont.

Pneumatic Tools
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
International Machinery & Supply Co., Montreal, Que.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Polishing and Buffing Machines
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng

Pressed Steel Parts
Ackworthie, Ltd., John, Birmingham, Eng
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont

Presses, Arbor
Atlas Press Co., Kalamazoo, Mich.
National Engineering Co., Sarnia, Ont
Petrie, Ltd., H. W., Toronto, Ont
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

Presses, Drop and Forging
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

Presses, Foot and Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng

Presses, Forcing
Atlas Press Co., Kalamazoo, Mich
Niagara Machine & Tool Works, Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot

Presses, Hydraulic
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Niagara Machine & Tool Works, Buffalo, N.Y.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

Presses, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Screw
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Profiling Machines
Alkenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Protractors
Brown & Sharpe Mfg. Co., Providence, R.I.

Propellers
Kennedy & Sons, Wm., Owen Sound, Ont.

Pulleys, Cork Insert
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

Pulleys, Metal and Fibre
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Pulp and Paper Mill Equipment
MacKinnon Steel Co., Sherbrooke, Que

Pumps, Automobile Tire
Tallman Brass & Metal, Ltd., Hamilton, Ont

Pumps, Barrel and Boiler-feed
Trahern Pump Co., Rockford, Ill.

Pumps, Circulating and Coalant
Trahern Pump Co., Rockford, Ill

Pumps, Geared and Hand
Trahern Pump Co., Rockford, Ill.

Pumps, Industrial
Trahern Pump Co., Rockford, Ill

Pumps, Hydraulic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot
Trahern Pump Co., Rockford, Ill.

Pumps, Lubricant and Oil
Bowser & Co., Inc., S. F., Fort Wayne, I
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

Pumps, Power
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

Punches, Center
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

Punches, Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Jardine & Co., A. B., Hespeler, Ont.

Punches, Power
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toledo Machine & Tool Co., Toledo, Ohio

Punching Machines, Horizontal
Bertrams Ltd., Edinburgh, Scotland

Pyrometers, Electric
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Racks, Cut
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

Racks, Storage (See Furniture, Machine Shop)
Brantford Oven & Rack Co., Brantford, Ont.

Rammers, Foundry
Holden Co., Ltd., Montreal, Que.

Reamer Holders
Cleveland Twist Drill Co., Cleveland, O
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

Reamers, Expanding
Alkenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Reamers, Solid
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Reamers, Taper
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.
Taylor Tool Co., J. A. M., Toronto, Ont
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Recorders, Temperature
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd Hiram, Walkerville, Ont.

Recorders, Time
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Regulators, Automatic (for electric furnaces)
Volta Mfg. Co., Welland, Ont.

Rheostats
Northern Electric Co., Montreal, Que

Resistance Materials
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Respirators
Willson Goggles, Inc., Reading, Pa.

Rivets
Parmenter & Bulloch Co., Gananoque, Ont.

Rivet Heaters
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

Rivet-Making Machinery
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.
Ryerson & Son, Jos. T., Chicago, Ill

Riveting Machines
Bilton Machine Co., Bridgeport, Conn.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill
Schuster Co., F. B., New Haven, Conn.

Rolling Mill Equipment
Stewart & Co., Duncan, Glasgow, Scot

Rolls (Rubber Covered)
Can. Consolidated Rubber Co., Ltd., Montreal Que.

Rudder Frames, Steel
Can. Steel Foundries, Montreal, Que.

Rubber Goods, Mechanical
Quaker City Rubber Co., Philadelphia, Pa.

Rules, Steel
Chesterman & Co., Ltd., J., Sheffield, Eng

Rules, Steel and Wood
Brown & Sharpe Mfg. Co., Providence, R.I.

Rust Preventatives
Oakley Chemical Co., New York, N.Y.

Sand Paper
Wausau Abrasives Co., Chicago, Ill.

Sand Equipment
Can. Link-Belt Co., Toronto, Ont

Sand Mills
Frost Mfg. Co., Chicago, Ill.

Sand Rammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Keller Pneumatic Tool Co., Grand Haven, Mich

Saw Frames and Blades, Hack
Alkenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que

Sawing Machines, Metal
Atkins & Co., Inc., E. C., Indianapolis, I
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que
Ryerson & Son, Jos. T., Chicago, Ill.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Sawing Machines, Power Hack
Ackworthie, Ltd., John, Birmingham, Eng
Atkins & Co., Inc., E. C., Indianapolis, I
Williams Machinery & Supply Co., A. R., Montreal, Que.

Saw Sharpening Machines
Atkins & Co., Inc., E. C., Indianapolis, I
Oliver Machinery Co., Grand Rapids, Mich

Saw Tables, Universal
Atkins & Co., Inc., E. C., Indianapolis, I
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
McKenzie Machinery Co., Guelph, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Saws, Circular Metal
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hand
Alkenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

Saws, Hot and Cold
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

Saws, High Speed Steel
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que

Saws, Metal Band
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saws, Metal, Power
Clemson Bros., Inc., Hamilton, Ont

Saws, Metal Cutting
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

Saws, Milling
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Saws, Screw Slotting
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Swing Cut-off
Oliver Machinery Co., Grand Rapids, Mich.

Scales
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

Screens
Can. Wire & Iron Goods Co., Hamilton, Ont.

Screw Driving Machine
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

Screw Extractors
Cleveland Twist Drill Co., Cleveland, O.

BUYERS' DIRECTORY

Screw Machine Work
Barnes Co., Wallace, Bristol, Conn
Cook Co., Asa S., Hartford, Conn
National Acme Co., Cleveland, Ohio
Tallman Brass & Metal Co., Hamilton Ont.

Screw Machinery, Wood and Lag
Cook Co., Asa S., Hartford, Conn

Screw Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Screw Machines, Automatic
Garlock Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio

Screw Machines, Plain or Hand
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio

Screw Plates
Alkenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

Screws, Cap and Set
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

Screws, Machine
Barnes Co., Wallace, Bristol, Conn.

Screws, Safety Set
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John Ingersoll, Ont.

Second-Hand Machinery
(See Searchlight Section)
Peter Ltd., H. W., Toronto, Ont.

Separators, Moisture and Oil
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Separators, Oil and Waste
Bowser & Co., Inc., S. F., Fort Wayne, I.

Shafting
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Shapes, Cold-Drawn Special Steel
Union Drawn Steel Co., Hamilton, Ont.

Shaping Machines
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
McKenzie Machinery Co., Guelph, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Toomey Inc., Frank, Philadelphia, Pa.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Shapers, Wood
Oliver Machinery Co., Grand Rapids, Mich.

Shears, Hand
Can. Blower & Forge Co., Ltd., Kitchener.

Shears, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Tullis & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.

Shearing Machines, Angle, Iron Bar and Gate
Bertrams Ltd., Edinburgh, Scotland

Sheet Metal Working Machinery
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

Sheets, Nickel, Resist, Alloy
International Nickel Co. of Can., Ltd., Toronto, Ont.

Sheets, Nickel, Monel and Fibre
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

Side Frames, Locomotive
Can. Steel Foundries, Montreal, Que.

Slotting Attachments
Ford Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

Slotting Machines
Lewis & Son Co., Ltd., The John, Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Ford Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

Solders
Bryce Smelting & Refining Co., Ltd., Montreal, Que.

Special Machinery and Tools
Brown Engineering Corp., Ltd., Toronto
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Machine Co., Ltd., Montreal, Q.
Ford Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio

Spectacles, Industrial
Willson Goggles, Inc., Reading, Pa.

Springs
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Stone Ltd., James, Guelph, Ont.

Sprockets and Chains
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lamson Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Squares
Brown & Sharpe Mfg. Co., Providence, R.I.

Stamping, Metal
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Elliott & Whitehall Tool Co., Galt, Ont.
Elgar Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Stamps, Steel
Diamond Saw & Stamping Works, Buffalo, N.Y.

Stairways, Wrought Iron
Can. Wire & Iron Goods Co., Hamilton, Ont.

Steam Specialties
Crane Ltd., Montreal, Que.

Steel Plate
Dom. Foundries & Steel, Hamilton, Ont.

Steels, Tool
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel, Cold-Rolled Strip
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.

Steel Castings
Dom. Foundries & Steel, Hamilton, Ont.

Steel Forgings
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Steel, Shafting and Free Cutting Screw
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

Steel, Sheet
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Illingsworth Steel Co., John, New York City, N.Y.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

Steel, Tanks
Can. John Wood Mfg. Co., Toronto, Ont.

Steel, Stainless
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steels, Alloy, Open Hearth and Electric
United Alloy Steel Corp., Canton, Ohio.

Steels, Alloy and Carbon
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong, Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Drawn Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Illingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steels, High-Speed
Armstrong Bros. Tool Co., Chicago, Ill.
Atkinson Wortman Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Illingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel, Magnet
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steel, Structural
MacKinnon Steel Co., Sherbrooke, Que.

Steel Tubing, Close Joint and Welded
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

Stern Frames, Cast Steel
Can. Steel Foundries, Montreal, Que.

Stools, Shop
Ministry of Munitions, London, Eng.

Straightening Machinery
Bertrams Ltd., Edinburgh, Scotland
Robson & Son, Jos. T., Chicago, Ill.

Studs
Galt Machine Screw Co., Galt, Ont.

Surface Plates
Bilton Machine Co., Bridgeport, Conn.

Swaging Machines
Atkins & Co., Inc., J. C., Indianapolis, I.

Switches, Railway
Can. Steel Foundries, Montreal, Que.

Switches and Switchboards
Northern Electric Co., Montreal, Que.

Tablets, Bronze, Memorial
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Tachometers
Alkenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

Tanks, Steel
MacKinnon Steel Co., Sherbrooke, Que.
Can. John Wood Mfg. Co., Ltd., Toronto, Ont.

Tanks and Pumps, Oil
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

Tap Holders
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Taper Pins
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co. of Canada Ltd., Dundas, Ont.

Tapes, Measuring
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

Tapping Machines and Attachments
Acme Machine Tool Co., Cincinnati, Ohio.
Archbald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Cincinnati, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Perin, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Taps and Dies
Ackworthe Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.
Taylor Tool Co., J. A. M., Hamilton, Ont.

Taps, Collapsing
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Morden Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

Teeth, Dredge Bucket
Kerley & Sons, Wm., Owen Sound, Ont.

Testing Metals and Materials
Page Testing Laboratory, Peterboro, Ont.

Thermometers
Bristol Co., Waterbury, Conn.

Thread-Cutting Tools
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Morchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Thread Cutting Machines
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

Threading Machines
Acme Machine Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Morchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Thread Lead Testing Machines
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Thread-Rolling Machines
Bliss Co., E. W., Brooklyn, N.Y.

Tongs
Henburn Ltd., John T., Toronto, Ont.

Tool Cases
Rice Lewis & Son, Ltd., Toronto, Ont.

Tool Holders
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Markers, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Tool Posts, Lathe
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Steels for all Purposes
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Tools, Small (See Machinists' Small Tools)
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland
Burgess & Marchand, Montreal, Que.
Chesterman & Co., Ltd., J., Sheffield, Eng.
Elliott & Whitehall Tool Co., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
Ministry of Munitions, London, Eng.
National Machine Tool Co., Racine, Wis.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wells Brothers Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Tool Work
Bryce Engineering Corp., Ltd., Toronto
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.

Torches, Blow
Can. Hauck Burner Co., Port Hope, Ont.
International Machinery & Supply Co., Montreal, Que.
Peter, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

Trackwork, Railway
Can. Steel Foundries, Montreal, Que.

Trackwork, Manganese Steel
Can. Steel Foundries, Montreal, Que.

Transformers
Northern Electric Co., Montreal, Que.

Transmission Machinery
Barnes Locomotive Co., N., Fotterville, Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Kerley & Sons, Wm., Owen Sound, Ont.
Perin, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal, Que.

BUYERS' DIRECTORY

Transportation Systems (See Trucks)
Mathews Gravity Carrier Co., Port Hope, Ont.

Treated Bits
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa

Trolleys and Tramways
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Wright Mfg. Co., Lisbon, Ohio.

Trucks
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cowan Truck Co. (R. B. Smiley), Toronto Ont.
Diamond State Fibre Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

Trucks, Industrial Motor
Maple Leaf Mfg. Co., Montreal, Que.
Ministry of Munitions, London, Eng.
National Steel Car Corp., Ltd., Hamilton, Ont.

Tube, Products
Tube Co. of Canada, Toronto, Ont.

Tubing, Electric Welded or Oxy-Acetylene Welded
Tube Co. of Canada, Toronto, Ont.

Tubing, Flexible
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Tubing, Seamless Steel
Tube Co. of Canada, Toronto, Ont.

Tubing, Seamless Steel, Brass and Copper and Fibre
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont
Lyman Tube & Supply Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont

Tubing, Welded
International Nickel Co. of Can., Ltd., Toronto, Ont.

Tubing, Welded Steel
Tube Co. of Canada, Toronto, Ont

Turbines, Water
Kennedy & Sons, Wm., Owen Sound, Ont.

Turret Heads
Ackworthie, Ltd., John, Birmingham, Eng
Bertram & Son Co., Ltd., The John, Dundas, Ont.

Turret Machines (See Lathes, Horizontal Turret)
Acme Machine Tool Co., Cincinnati, Ohio
Cook Co., Asa S., Hartford, Conn
Gisholt Machine Co., Madison, Wis
Jones & Lamson Machine Co., Springfield Vermont.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.
Shaw Turret Machine Co., Madison, Wis
Warner & Swasey Co., Cleveland, Ohio

Turrets, Tool Post
Gisholt Machine Co., Madison, Wis

Unions, Pipe
Crane Ltd., Montreal, Que.

Universal Joints
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

Valves
Can. Fairbanks-Morse Ltd., Montreal Q
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.

Valves, Rubber Pump
Quaker City Rubber Co., Philadelphia, Pa

Vises, Drilling Machine
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

Vises, Metal Workers'
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O

Vises, Milling Machine
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Q
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis

Vises, Pipe
Columbia Hdwe. Division, Cleveland, O
Greenfield Tap & Die Corp., Galt, Ont

Vises, Planer and Shaper
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont

Vises, Wood Workers'
Columbia Hdwe. Division, Cleveland, O
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque, Ont.

Washers, Rubber
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.

Welding Apparatus, Oxy-Acetylene
L'Air Liquide Society, Toronto, Ont

Welding, Electric
Carter Welding Co., Toronto, Ont
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto Ont

Voltmeters
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

Wagon Loaders
Can. Link-Belt Co., Toronto, Ont.

Washers
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

Welding Filler Rods
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

Welding Machines, Oxy-Acetylene
Davis-Bournonville Co., Jersey City, N.J
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

Welding, Oxy-Acetylene
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont

Welding Rod, Tobin, Manganese Bronze and Aluminum
Tallman Brass & Metal Ltd., Hamilton Ont.

Welding Supplies
British Smelting & Refining Co., Ltd Montreal, Que.
Carter Welding Co., Toronto, Ont
Davis-Bournonville Co., Jersey City, N.J
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

Wheels, Industrial
American Pulley Co., Philadelphia, Pa
Hull Iron & Steel Foundries, Hull, Que
Kennedy & Sons, Wm., Owen Sound, Ont

Winches, Electric
Volta Mfg. Co., Welland, Ont.

Winches, Headgate
Kennedy & Sons, Wm., Owen Sound, Ont.

Winches, Stoplog
Kennedy & Sons, Wm., Owen Sound, Ont

Wire
Barnes Co., Wallace, Bristol, Conn
Canada Metal Co., Ltd., Toronto, Ont
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont
Northern Electric Co., Montreal, Que

Wire Cloth
Can. Wire & Iron Goods Co., Hamilton, Ont.

Wire Rope
Can. Wire & Iron Goods Co., Hamilton Ont

Wire Straightening and Cutting Machinery
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Schuster Co., F. B., New Haven, Conn

Wire, Welding
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont
Tallman Brass & Metal Co., Hamilton Ont

Wires, Special
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont
Walker & Sons Metal Products, Ltd Hiram, Walkerville, Ont

Woodworking Machinery
Canada Machinery Corp., Galt, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Wrenches, Drop Forged
Armstrong Bros. Tool Co., Chicago, Ill
Canada Foundries & Forgings Co., Welland, Ont.

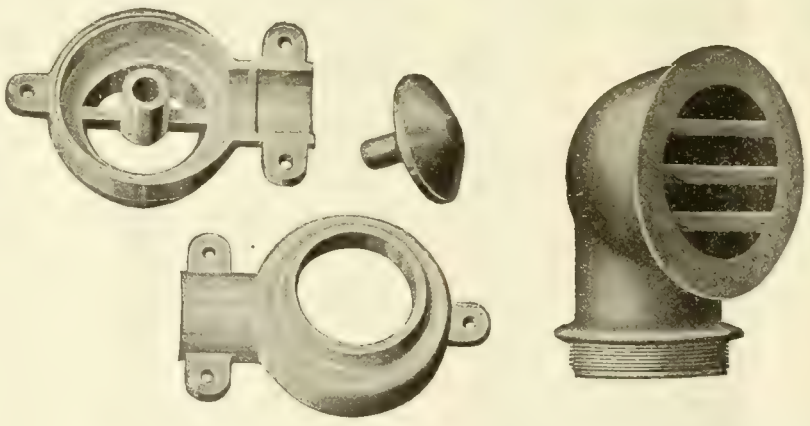
Wrenches, Machinists'
Armstrong Bros. Tool Co., Chicago, Ill
Canada Foundries & Forgings Co., Welland, Ont.

Wrenches, Pipe
Canada Foundries & Forgings Co., Welland, Ont.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont

Wrenches, Tap
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont

DIE-CASTINGS

DOEHLER PROCESS



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Note the smooth appearance of the Die-Castings in the illustration. No burrs—no rough spots. Cored holes are perfectly round and centred. Require practically no machining

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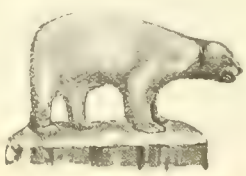

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HAMILTON, ONT.

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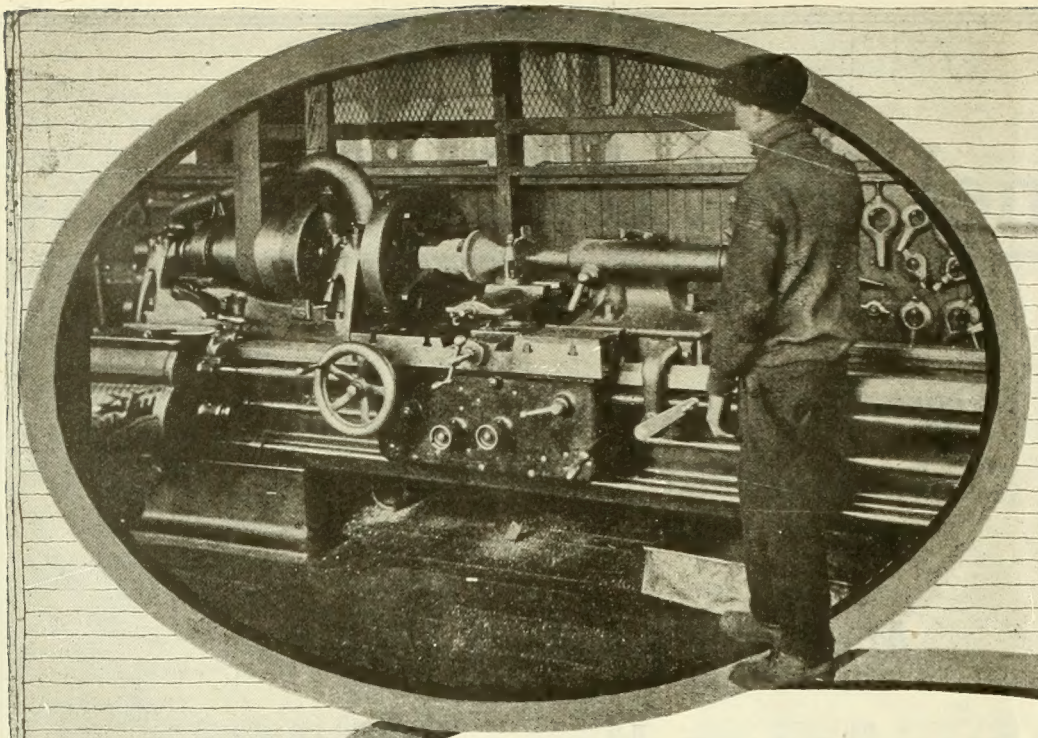

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Hendey Lathes Speed Up Rush Work

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The above 24-inch HENDEY Engine Lathe is machining a valve seat. This operation it completed with the usual HENDEY speed and accuracy, in two hours.

For speed, for accuracy, for durability and low maintenance there is no better lathe than the HENDEY. The satisfaction they are rendering their users everywhere can be duplicated on *your* work.

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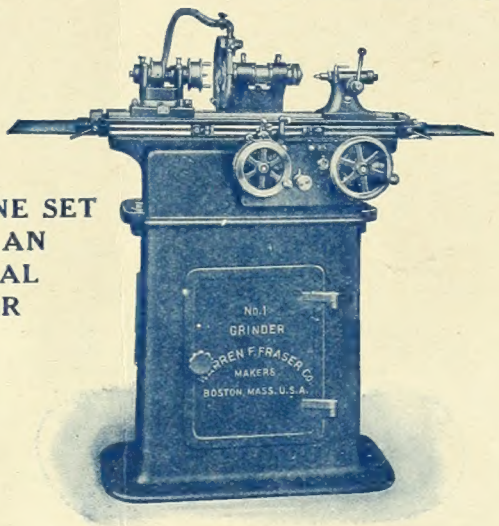
Foss QUALITY Foss SERVICE Foss

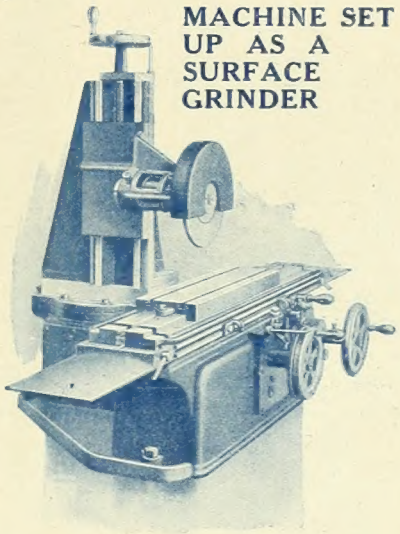
FRASER No. 1 Universal Convertible Grinder

(Patented May 28, 1918)

MACHINE SET UP AS AN INTERNAL GRINDER



MACHINE SET UP AS A SURFACE GRINDER



By the change of heads the machine can be converted into an efficient high-speed internal grinder; also a surface grinder of considerable range

PATENTED APRON CONSTRUCTION. All the springs on this machine are enclosed and can be removed or replaced without disturbing any other part of the machine.

Capacity: Cylindrical work, 8 in. x 2 in.
Surface work, 6 in. x 20 in.
and up to 8 in. in height.

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And many others.

The Geo. F. Foss Machinery & Supply Co., Limited

305 St. James Street : : Montreal, Que.

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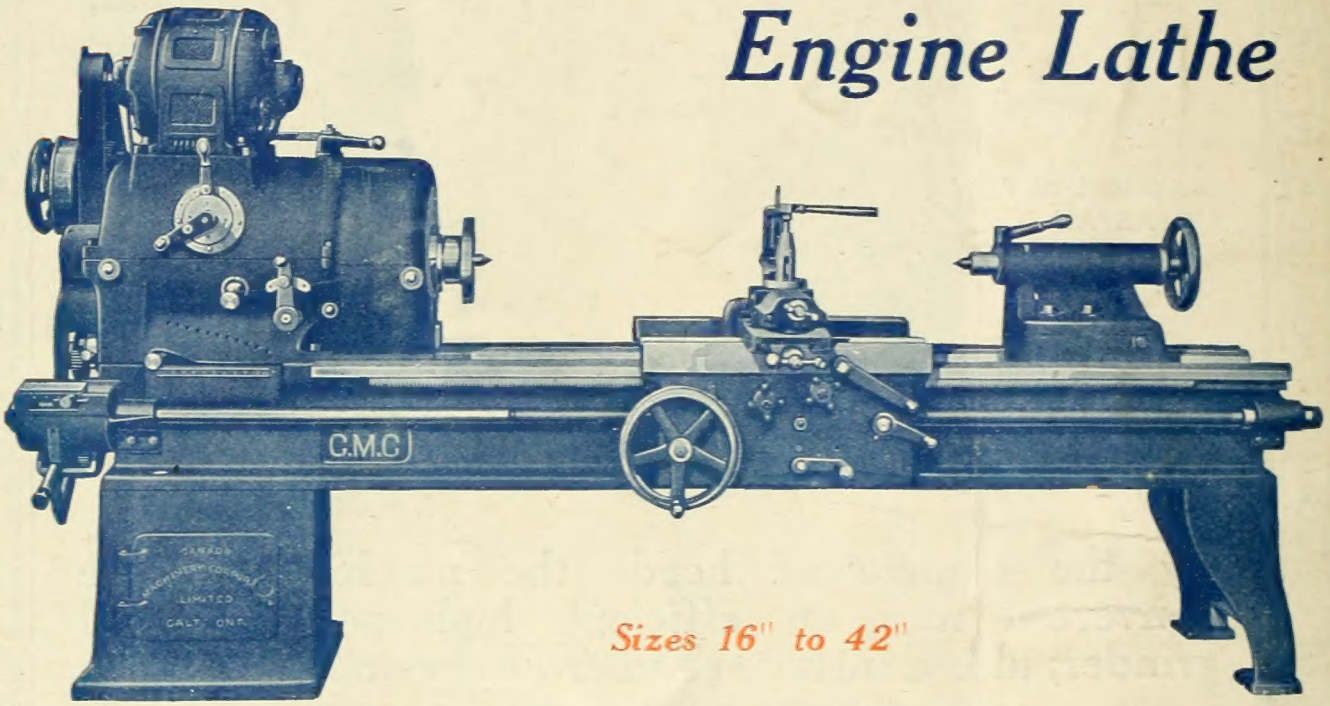
Foss QUALITY Foss SERVICE Foss

The C.M.C. Motor Driven All Geared Head Engine Lathe



Sizes 16" to 42"

This Lathe does not depend on belts or line shafts to keep it going and has, therefore, many distinct advantages over the belt-driven machine.

It may be run when the rest of the plant is idle. Remember that odd job you wanted to finish after hours and couldn't do it without running the whole shop?

It may be placed in the position most suitable for the work required to be done, regardless of shafting or belting arrangements.

Eighteen speeds are supplied from thirteen gears, making it very simple to operate.

Full details and prices on request.

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